In Parliament – Session 2021 - 2022

HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix EC-016-00004

Ecology and biodiversity

Document to inform a Habitats Regulations Assessment for Rochdale Canal Special Area of Conservation

M140

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Department for Transport

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1 Introduction

1.1 Purpose of report

1.1.1 There are certain ecological sites that are designated for their international importance and to which special considerations attach under the Conservation of Species and Habitat Regulations 2017 ('the Habitats Regulations')[1], either through operation of law or government policy.

1.1.2 These sites include Special Areas of Conservation (SAC) that have been designated to protect certain species and habitats; Special Protection Areas (SPA), designated to protect certain species of wild birds; and Ramsar sites designated to protect internationally important wetland areas.

1.1.3 These sites are subject to special legal protection that imposes restrictions on a 'competent authority' from granting consent permission or authorisations for any plan or project that may affect the conservation status and integrity of these designations. In the case of the hybrid Bill, the responsible competent authority is Parliament as it is the enactment of the Bill as legislation that grants consent for the hybrid Bill scheme to be undertaken.

1.1.4 The Habitats Regulations require the competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which is likely to have a significant effect on these designated sites (either alone or in combination with other plans or projects) to make an appropriate assessment of the implications of the plan or project for potentially affected sites in view of those sites' conservation objectives.

1.1.5 There are normally two stages in the process of discharging the duties imposed by the Habitats Regulations. The first is to undertake a 'screening' exercise to determine whether there is no reasonable scientific doubt that the plan or project will be likely to have a significant effect on the site's conservation objectives. If no such likelihood is identified, the competent authority may proceed to grant consent for the plan or project in question. If, on the other hand, there remains a reasonable scientific doubt as to its effects on the integrity of the site at this stage, the competent authority must move to a second stage and undertake a more detailed assessment, commonly referred to as an 'appropriate assessment' to determine whether, having regard to any mitigation measures that are proposed to be adopted in the delivery of the scheme, there will be an adverse effect on the integrity of the site.

1.1.6 If the appropriate assessment does not identify an adverse effect on the integrity of the site, the competent authority may proceed to grant the consent. If an adverse effect cannot be

[1] *The Conservation of Habitats and Species Regulations 2017* (2017/1012), as amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (2019/579). London, Her Majesty's Stationery Office.

ruled out, consent can only be granted on the basis that there are: no alternative solutions; there are imperative reasons of overriding public importance for the plan or project to proceed; and appropriate compensatory measures have been secured.

1.1.7 It is Parliament as legislator (and not HS2 Ltd as the prospective developer) that is the competent authority and the body which is required to comply with the requirements of the Habitats Regulations. The purpose of this Habitat Regulations Assessment (HRA) report is, however, to provide information to Parliament, based on HS2 Ltd's assessment of the hybrid Bill scheme, in order to inform and assist Parliament in complying with its obligations under the Habitats Regulations.

1.2 Background

1.2.1 Heavy goods vehicles (HGV) and other traffic associated with the construction of the Proposed Scheme will make use of the M60 and M62 where it lies in proximity to the Rochdale Canal Special Area of Conservation SAC (or European site). The risk of pollution from this traffic prompted production of this report to inform a HRA.

1.2.2 This report has been prepared to provide all the necessary information for the competent authority to carry out an HRA under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 as amended by the Conservation of Habitats and Species (amendment) (EU Exit) Regulations 2019[2]. It is informed by contemporary Department for Environment, Food and Rural Affairs (Defra), and Ministry of Housing, Communities and Local Government (MHCLG) guidance[3,4] and best practice. Where relevant, it takes full account of case law including the People Over Wind[5] and Wealden[6] judgements.

[2] The amending regulations generally seek to retain the requirements of the 2017 Regulations but with adjustments for the UK's exit from the European Union. See Regulation 4, which also confirms that the interpretation of these Regulations as they had effect, or any guidance as it applied, before exit day, shall continue to do so.

[3] Department for Environment, Food and Rural Affairs and Natural England (2021), *Habitats regulations assessments: protecting a European site.* Available online at: https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site.

[4] Ministry of Housing, Communities & Local Government (2019), *Planning Practice Guidance*. Available online at: https://www.gov.uk/guidance/appropriate-assessment.

[5] People Over Wind and Peter Sweetman v Coillte Teoranta (2018), High Court (Ireland), Case C-323/17 (also referred to as the Sweetman II judgement).

[6] Wealden District Council v SS Communities and Local Government, Lewes District Council and South Downs National Park Authority (2017), High Court of Justice, Case CO/3943/2016/ No EWHC 351.

2 Context

2.1 Description of the Proposed Scheme

2.1.1 The Proposed Scheme comprises the construction and operation of a new high speed railway between Crewe and Manchester with a connection onto the West Coast Main Line (WCML). In the Davenport Green to Ardwick Area (MA07) the Proposed Scheme comprises part of the HS2 Manchester spur 13.4km in length of which 12.8km is in tunnel, continuing from the northern boundary of the Hulseheath to Manchester Airport area (MA06). Within the Manchester Piccadilly Station area (MA08) the route of the Proposed Scheme will consist of 58m of cutting, 104m of embankment and 882m of viaduct, and includes the construction of Manchester Piccadilly High Speed station, provision for future connection to NPR, and Metrolink realignment and extension

2.1.2 A construction traffic route, required to enable the movement of materials from the construction of new station facilities at Manchester Piccadilly Station in central Manchester, extends eastwards along the A635 providing access to junction 23 of the northbound and southbound carriageways of the M60 orbital motorway. Given their place in the strategic road network, the M60 and M62 are also anticipated to be used by employees making their way to and from the construction sites, and accommodate both domestic traffic redistributed from other routes in the area caused by construction of the Proposed Scheme.

2.1.3 In turn, the M60 provides direct connections to the M56/M6 to the south, M61 to the north-west and M62, both east and west.

2.1.4 Rochdale Canal SAC is situated approximately 2.7km and 4.2km north-east of the land required for the construction of the Proposed Scheme in MA07 and MA08, respectively. At various points, parts of the affected road network are within 200m of the SAC. Permanent impacts on traffic flows from construction of the Proposed Scheme are anticipated to extend beyond the end of the construction period.

2.2 Site description and conservation objectives

Rochdale Canal SAC

2.2.1 The Rochdale Canal SAC was designated in 2000, is approximately 20km in length and occupies an area of 25.5ha that extends north-east from Failsworth, north-east of Manchester city centre, to Littleborough in the Pennines (Figure 1). The citation[7] and

[7] Department for Environment, Food and Rural Affairs (2005), *Citation for Special Area of Conservation Rochdale Canal*. Available online at: http://publications.naturalengland.org.uk/file/6246935312728064.

conservation objectives[8] confirm the sole reason for designation is the 'extensive colonies' of floating water-plantain (*Luronium natans*). England and Wales support a large proportion of the global population of this species.

2.2.2 The citation for the underpinning Site of Special Scientific Interest (SSSI)[9] described the site as moderately nutrient rich (or mesotrophic) but noted water quality varied along its length reflecting the supply of water, from ombrotrophic in the uplands to mesotrophic towards Manchester. Species composition, abundance and distribution varies accordingly but overall, the site is considered to support important, diverse, submerged and emergent plant communities that are typical of moderately acidic to moderately alkaline conditions. Some localised enrichment is apparent, however.

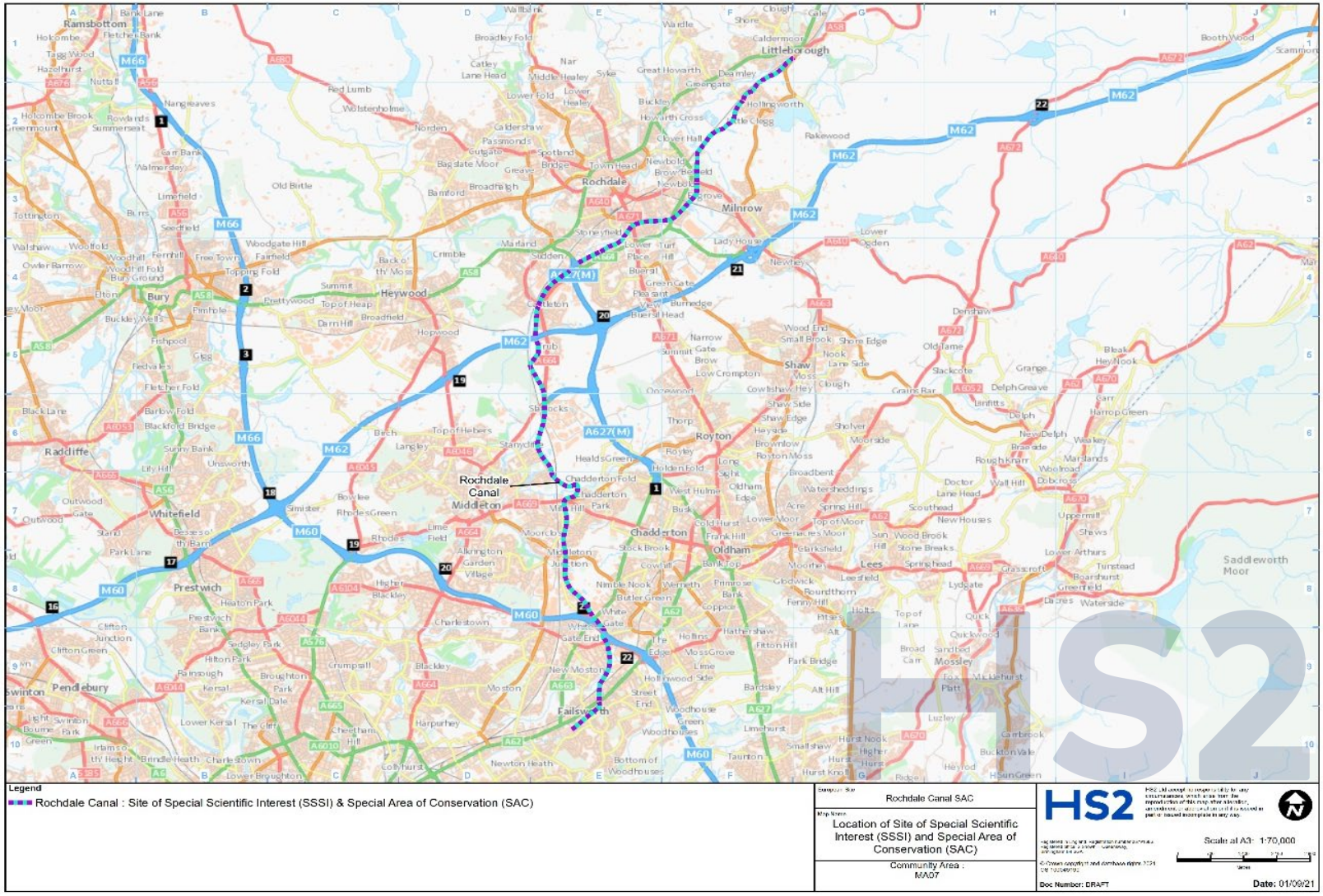
2.2.3 Opened in 1804, the Rochdale Canal extended for a distance of over 50km from the centre of Manchester to Sowerby Bridge in West Yorkshire, and provided direct access to the Bridgewater Canal in the west and the Calder and Hebble Navigation in the east. The canal subsequently fell into decline before being officially closed to navigation in 1952. However, following subsequent restoration, which in places involved considerable engineering activities, navigation was fully restored in 2002. Today, it is managed by the Canal & River Trust.

2.2.4 The hydrological catchment boundary lies high in the Pennines (183m altitude) approximately 2km north of Littleborough, and there is a modest flow east and west from this point. The canal is supplied with water from a number of sources with different characteristics. Nutrient poor (or oligotrophic) water is provided by Blackstone Edge Reservoir and Hollingworth Lake in the Pennines, whilst more nutrient rich water is provided elsewhere towards Manchester.

[8] Natural England (2018), *European Site Conservation Objectives for Rochdale Canal Special Area of Conservation*. (version 3). Available online at: http://publications.naturalengland.org.uk/file/5260852207026176.

[9] English Nature (2000), *Rochdale Canal Site of Special Scientific Interest Citation.* Available online at: https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/2000430.pdf.

Figure 1: Location map for the Rochdale Canal SAC*



** Land required for construction of the Proposed Scheme is 2.6km to the south-west and not shown on this map due to scale.*

Conservation objectives

2.2.5 The conservation objectives for the Rochdale Canal SAC state:

> 'Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
>
> - the extent and distribution of the habitats of the qualifying species;
> - the structure and function of the habitats of qualifying species;
> - the supporting processes on which the habitats of qualifying species rely;
> - the populations of the qualifying species; and
> - the distribution of the qualifying species within the site.'

2.2.6 These are given greater expression in the associated supplementary advice[10] and Site Improvement Plan (SIP)[11]. Both identify physical modification and 'air pollution' as negative factors. In addressing air pollution, the supplementary advice aims to:

> 'Restore as necessary the concentrations and deposition of air pollutants at or below the site-relevant Critical Load or Level values …'.

Condition assessment

2.2.7 Natural England's most recent condition monitoring assessment of the Rochdale Canal SSSI was carried out in 2010[12]. This found that the entire site was considered to be in 'unfavourable recovering' condition. Whilst this suggests the canal was making positive progress towards meeting its conservation objectives, the assessment also noted[13] that 'vegetation remains much less widespread than at the time of designation'. Whilst this suggests a visible decline in just 10 years, it is noted the assessment was carried out in November when such communities would be more difficult to assess. Overall though, the assessment is now over a decade old and little reliance can be placed on its findings.

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[10] Natural England (2019), *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features. Rochdale Canal Special Area of Conservation*. Available online at: http://publications.naturalengland.org.uk/file/5486009219547136.

[11] Natural England (2014), *Site Improvement Plan Rochdale Canal*. Available online at: http://publications.naturalengland.org.uk/file/4884283202207744.

[12] Natural England (2014), *SSSI Condition summary for Site Rochdale Canal SSSI*. Available online at: https://designatedsites.naturalengland.org.uk/ReportConditionSummary.aspx?SiteCode=S2000430&ReportTitle=Rochdale%20Canal%20SSSI.

[13] Natural England (2014), *Condition of SSSI Units for Site Rochdale Canal SSSI*. Available online at: https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S2000430&ReportTitle=Rochdale%20Canal%20SSSI.

2.3 Case law

2.3.1 In recent years, there have been a number of important rulings made by both domestic and European courts which could influence this HRA. The most relevant are described below.

People Over Wind judgement

2.3.2 The People Over Wind judgement (2017) drew a distinction between incorporated mitigation measures which are represented by the essential characteristics of a scheme and those added specifically to avoid or reduce an impact on qualifying features. The former, such as the general alignment of HS2, can be considered at screening whereas the latter are reserved for consideration in an appropriate assessment.

Wealden judgement

2.3.3 The Wealden judgement (2017) clarifies a limitation on the use of thresholds when used to rule out the likelihood of significant effects alone or in combination with other plans or projects, specifically the use of Annual Average Daily Traffic (AADT) figures. The Court concluded that where the likely effect of an individual plan or project does not itself exceed the threshold of 1,000 AADT, its impact must still be considered alongside the similar effects of other plans and projects to assess whether the combined effect could be significant. Where the in-combination effect is greater than this threshold, an appropriate assessment is typically required. In line with fRegulation 63(3), the need to consider in-combination assessment, is also carried through into the appropriate assessment if one is necessary.

Dutch Nitrogen case

2.3.4 Here, the Court of Justice of the European Union (CJEU)[14] confirmed that an appropriate assessment is not to take into account the future benefits of mitigation measures if those benefits are uncertain, including where the procedures needed to accomplish them have not yet been carried out or because the level of scientific knowledge does not allow them to be identified or quantified with certainty.

[14] Coöperatie Mobilisation for the Environment UA, Vereniging Leefmilieu v College van gedeputeerde staten van Limburg, College van gedeputeerde staten van Gelderland, European Court of Justice, (C 293/17, C 294/17) [2019] Env. L.R. 27 at paragraph 30.

Compton case

2.3.5 This case[15] explored how exceedances of the critical loads should be assessed. The Court ruled that when considering what approach is required to conclude no adverse effect on the integrity of a site:

> 'That could not be answered, one way or the other, by simply considering whether there were exceedances of critical loads or levels, albeit rather lower than currently. What was required was an assessment of the significance of the exceedances for the SPA birds and their habitats…'.

[15] Compton Parish Council, Julian Cranwell and Ockham Parish Council v Guildford Borough Council, SoS for Housing, Communities and Local Government (2019), High Court of Justice, EWHC 3242 (Admin) CO/2173,2174,2175/2019.

3 Likely significant effects

3.1 The likely significant effects test

3.1.1 Regulation 63(1) identifies whether the proposed development will result in a 'likely significant effect … (either alone or in combination)' on any European sites. Typically, an 'in-combination' assessment is only required where an impact is identified which would not result in a significant effect on its own but where significant effects may arise when combined with other plans or projects. The screening test is seen only as a 'trigger'[16] and identifies whether the greater scrutiny of an 'appropriate assessment' is necessary. Case law informs how Regulation 63(1) should be interpreted, as follows:

- 'significant' means 'any effect that would undermine the conservation objectives of a European site'[17];
- 'likely' is a low threshold and simply means that there is a 'risk' or 'doubt' regarding such an effect that 'cannot be excluded on the basis of objective information'[18]; and
- [it] '… is not that significant effects are probable, a risk is sufficient'… and there must be 'credible evidence that there was a real, rather than a hypothetical, risk'[19].

3.2 Potential impacts

3.2.1 The Rochdale Canal lies 2.6km north-east of land required for the construction of the Proposed Scheme and so direct construction related impacts such as dust deposition can be ruled out confidently. Changes in the hydrological regime can be discounted as Rochdale Canal is not dependent on groundwater and therefore, there will be no hydrogeological impact on the canal. The Proposed Scheme will not affect the quantity of surface water reaching the canal. Consequently, the only credible threat that could affect Rochdale Canal is air pollution, in the form of nitrogen deposition, from construction and operational traffic using the M60 and adjoining roads which lie close to the European site; there are no other credible threats. Consequently, this single factor is assessed in Section 3.3 below.

[16] Bagmoor Wind Limited v The Scottish Ministers (2012), Court of Session, CSIH 93.

[17] Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij (2004), European Court of Justice, C-127/02 (referred to as the Waddenzee judgement) at paragraphs 44, 47 and 48.

[18] Waddenzee at paragraphs 44 and 45.

[19] Peter Charles Boggis and Easton Bavants Conservation v Natural England and Waveney District Council (2009), High Court of Justice Court of Appeal case. C1/2009/0041/QBACF at paragraph 36 and 37.

3.3 Air pollution assessment methodology

3.3.1 The assessment of air pollution is informed by established best practice provided by Highways England (the Design Manual for Roads and Bridges (DMRB))[20], Natural England[21] and the Institute for Air Quality Management (IAQM)[22]. Together, these make clear that vehicle emissions can increase the airborne concentration of nitrogen oxides (NO_x) and the subsequent rate of nitrogen deposition. The latter can lead to nutrient enrichment and, over time, not only hinder the growth, abundance and distribution of (especially lower) plants, but can also prompt the growth of ruderal species which can lead to changes in structure and function of qualifying habitats. Whilst certain species and communities are less susceptible to harm than others, nitrogen deposition can also exacerbate the effects of other factors such as climate change or pathogens leading to negative, synergistic effects.

3.3.2 The rate of nitrogen deposition falls quickly in the first few metres from the roadside before gradually levelling out; beyond 200m, it becomes difficult to distinguish from background levels. In other words, impacts at 10m, 50m or more can be very different from those at the roadside, and beyond 200m, significant effects can be ruled out.

3.3.3 This change in deposition is heavily influenced by surface roughness. On land, models typically employ two categories of surface roughness ('forest' and 'grassland') to reflect long and short vegetation. However, the rate of nitrogen deposition on a flat surface of water is less well understood though it is reasonable to speculate it leads to less intense deposition in proximity to the road with wider dispersal at lower rates than on land. However, in this case, the value of 'grassland' has been employed. This is regarded as a precautionary approach as it can be expected to emphasise any negative outcomes.

3.3.4 Assessment of nitrogen deposition is required for ecologically sensitive sites within 200m of roads where one or more of the following DMRB criteria are met:

- change in road alignment by 5m or more;
- change in daily traffic flows by 1,000 vehicles or more as AADT;
- change in daily flows of Heavy Duty Vehicles (HDV)[23] by 200 AADT or more;

[20] Highways Agency (2019), *Design Manual for Roads and Bridges (DMRB),* Sustainability and Environmental Appraisal, LA 105 Air Quality, Highways Agency, London. Available online at: https://www.standardsforhighways.co.uk/dmrb/.

[21] Natural England (2018), *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations – v1.4 Final*. Available online at: http://publications.naturalengland.org.uk/file/5431868963160064.

[22] Holman et al. (2019), *A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0,* Institute of Air Quality Management, London. Available online at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2019.pdf.

[23] HDV are defined as those with an unladen weight of greater than 3.5 tonnes, including large vans; medium goods vehicles (rigid and artic); heavy goods vehicles (rigid and artic) and buses/coaches.

- change in daily average speed by 10kph or more; or
- change in peak hour speed by 20kph or more.

3.3.5 It can be seen, therefore, that the additional nitrogen deposition that might arise from increased traffic is only likely to be significant where: a European site lies within 200m of a road; and traffic flows are expected to increase (or other changes listed in Section 3.3.4 above are apparent) and, a feature is known to be sensitive to such effects. Should these criteria be met, best practice recommends that the ecological characteristics of the site should be explored and, if necessary, traffic and/or air quality assessments of traffic flows carried out to evaluate any impacts during construction or subsequent operation as appropriate.

3.3.6 The ecological characteristics of a site are derived from the formal citations, condition assessments, conservation objectives, favourable conservation tables (FCT), SIP, supplementary advice and any other surveys and management plans where available. Traffic flows are assessed by calculating AADT figures. The latter introduces further thresholds and, where changes in flows (alone and in combination) are less than 1,000 AADT[24] or 200 HDV, the risk of a significant effect can be ruled out and no further assessment is required. Should flows exceed these values, air quality analysis is required. Here, impacts are assessed by calculating the relative contribution of the plan or project in relation to the relevant critical level for NO_x and the critical loads for nitrogen deposition for the individual qualifying features. The air quality analysis typically models the rates of deposition at fixed points on a 200m transect extending from the roadside.

3.3.7 The critical level for NO_x is fixed and is expressed as a concentration: 30µg/m^3. It is a precautionary threshold below which there can be confidence that harmful effects on vegetation will not arise, and further assessment may not be necessary. If exceeded, assessment of critical loads is required. The critical loads for nitrogen deposition vary and are specific to each qualifying feature. These are presented as a range of values (expressed as a rate, e.g. 10kg N/ha/yr – 20kg N/ha/yr) and typically, as a precautionary approach, only the lowest value is used (unless there are compelling reasons to do otherwise) as this will emphasise any negative outcomes.

3.3.8 Should nitrogen deposition increase by less than 1% of the lower critical load, likely significant effects can be ruled out. However, should the 1% threshold be exceeded, a significant effect cannot be ruled out and an appropriate assessment will be required. It should be noted that the 1% threshold, set at two orders of magnitude below the critical load, is highly precautionary. Furthermore, an exceedance of the threshold does not mean that a significant (or adverse) effect will automatically occur, it only represents a trigger that prompts further assessment. Indeed, this emphasises that assessment is not about establishing a simple mathematical relationship. Account must be taken of the type of

[24] These values are utilised as there is evidence to show that these equate approximately to a 1% change in critical loads (see paragraph 3.3.8).

habitats (some are more resilient than others) and the distribution of the designated features as not all will be distributed evenly across sites, and other factors may be at play.

3.3.9 Natural England adds that where the existing background levels of NO_x or rates of deposition already exceed these values prior to implementation of a plan or project, the conservation objectives shift from seeking to maintain the condition of the qualifying features to aiming to restore them to a favourable conservation status. This reflects the greater challenge of restoring a site that could already be suffering harm from air pollution. It also makes clear that the impact assessment should focus on those objectives related to the structure and function of a site; those objectives most relevant to the impacts that could arise from air pollution are provided in Section 2.2.

3.3.10 Whilst assessment should, in the first instance, evaluate the plan or project in isolation, the Wealden decision makes clear that, should insignificant outcomes arise alone, the outcomes should also be assessed in combination with other plans or projects. This test is also carried through to the appropriate assessment (if one is required).

3.3.11 To determine whether a formal screening exercise is required, this HRA firstly assesses the preliminary criteria: proximity of the European site to a road and the volume of anticipated traffic. If necessary, it then screens the construction and/or operational phase either alone or in combination. An appropriate assessment follows subsequently, if required.

3.4 Screening assessment (construction) alone

Background

3.4.1 Key information is presented in Annex A, which summarises the associated air quality analysis. The following assessment draws on best practice (from Natural England and DMRB, see Paragraph 3.3.1) and utilises selected information from Annex A, though reference to the latter is encouraged.

Proximity assessment

3.4.2 The southern and northern stretches of the SAC (approximately 6.5km and 9.5km long respectively) run through the urban environments of Manchester and Rochdale, surrounded on both sides by residential and industrial land and numerous minor roads. These are separated by a 4km stretch of countryside (Figure 2 and Figure 3).

3.4.3 In a number of locations, the SAC is crossed by major roads include the:

- M60 junction 21 to junction 22;
- M60 within junction 21;
- A663 (Broadway); and
- M62 junction 19 to junction 20.

Figure 2: Location of potential air quality impacts at Rochdale Canal (north)

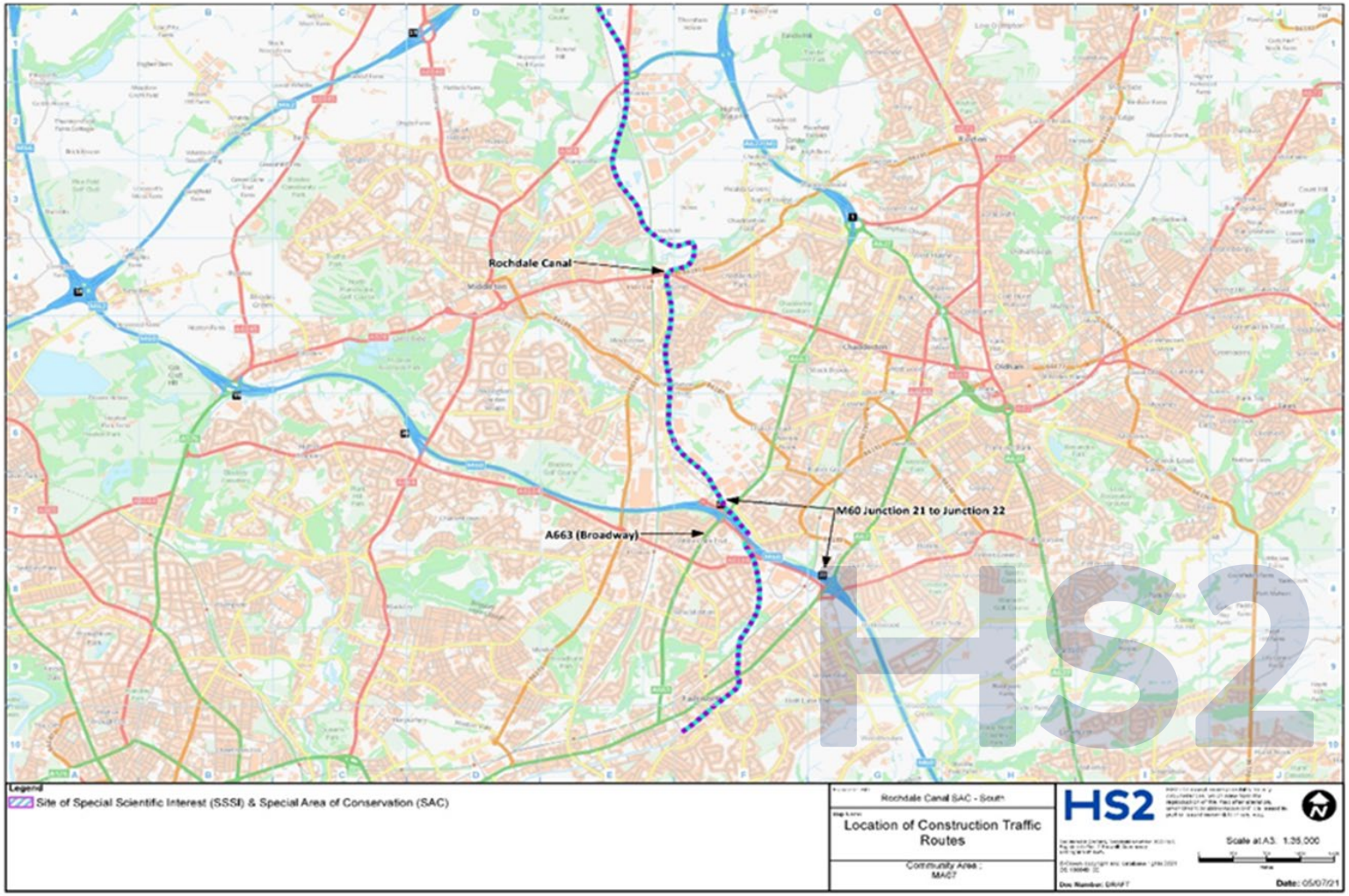
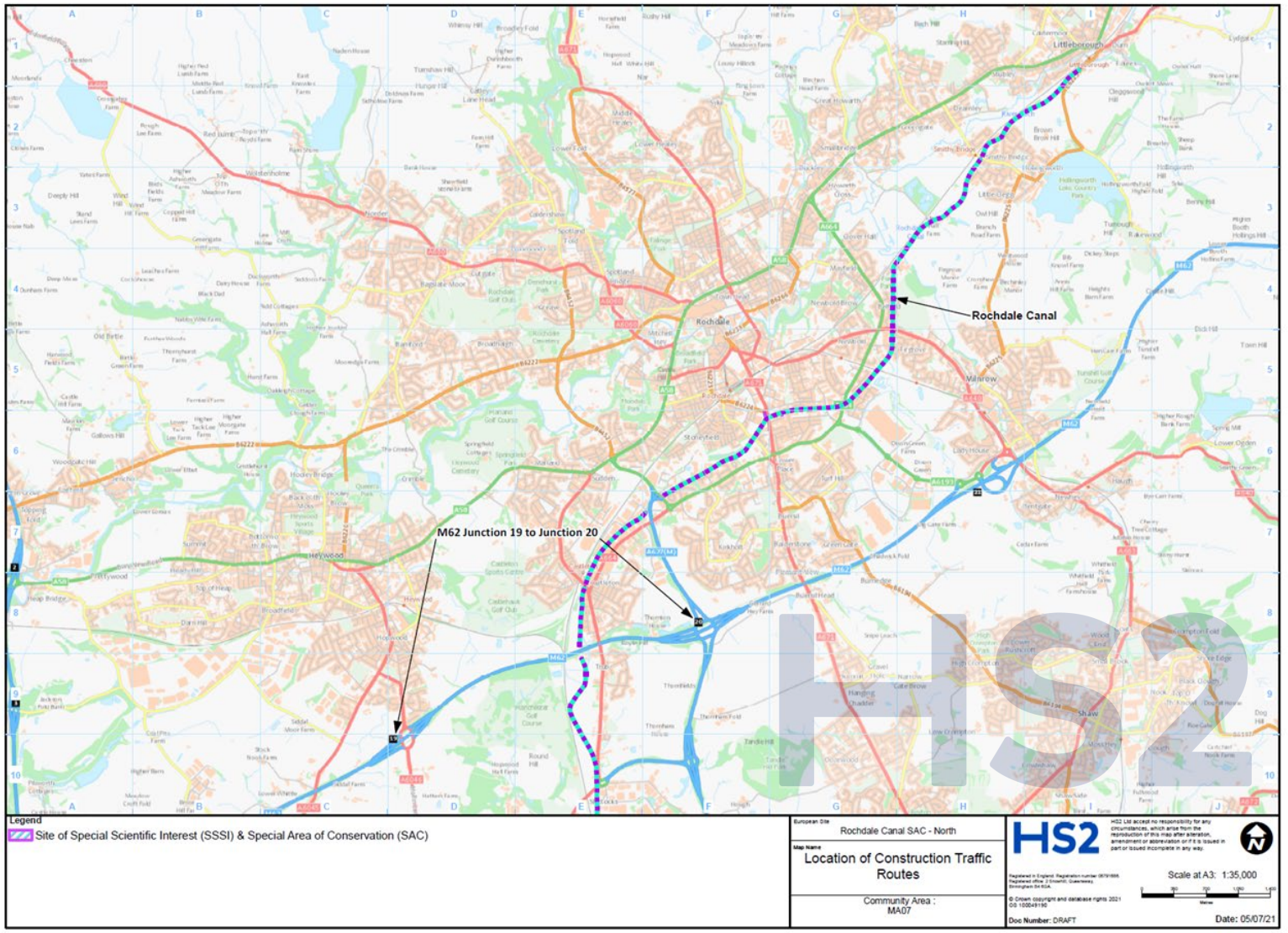


Figure 3: Location of potential air quality impacts at Rochdale Canal (south)



3.4.4 These locations form the broad geographical extent of this HRA. Whilst the majority intercept the canal on the perpendicular, the alignment of the M60/Broadway junction results in the motorway and slip roads running alongside the SAC for a distance of around 1km. Therefore, it is clear that a considerable section of the Rochdale Canal lies well within the 200m threshold of a number of major roads. Consequently, an air quality assessment of traffic flows is required.

Air quality assessment of traffic flows

3.4.5 The air quality assessment of traffic flows in proximity to Rochdale Canal has been undertaken in accordance with the Environmental Impact Assessment Scope and Methodology Report (SMR) (see Volume 5: Appendix CT-001-00001). This is summarised in Annex A.

3.4.6 A planned construction traffic route will direct traffic from the centre of Manchester along the A635 and onto the M60 at junction 23. Construction is anticipated to last for a period of several years. During this time, it is also anticipated the M60 will be utilised by a proportion of the workforce of the Proposed Scheme travelling to and from work. In addition, it is expected this, and other main roads in the area will accommodate domestic traffic unrelated to the Proposed Scheme that is redistributed from other routes by delays and diversions caused by the construction of the Proposed Scheme. Post-construction, in the operational phase, some of the behaviours of the latter are anticipated to continue. Whilst construction and workforce traffic will represent a temporary effect, albeit over several years, the displacement of domestic traffic during the operational phase is considered to be permanent. Construction is anticipated to commence in 2025 and cease in 2038; the operational phase is considered to commence in 2038.

3.4.7 Roads investigated under this scenario are:

- M60 junction 21 to junction 22;
- M60 within junction 21;
- A663 Broadway; and
- M62 junction 19 to junction 20.

3.4.8 Table A2 of Annex A indicates that the construction of the Proposed Scheme alone and in combination will exceed the screening thresholds of 1,000 AADT and 200 HDV, primarily because of traffic on or associated with the M60 and M62. In turn, Table A9 and Table A10 of Annex A confirms a similar picture except that the thresholds are not exceeded during operation, alone, but are in combination with other plans and projects.

3.4.9 Consequently, likely significant effects can be ruled out of the operational phase alone, without the need for any further assessment. However, a formal screening exercise and air quality assessment of traffic flows will be required to assess the impact of the Proposed Scheme both alone and in combination during construction and for operation in combination.

Figure 4: Map of Rochdale Canal SAC, M60/A663 interchange, Transects 1-5

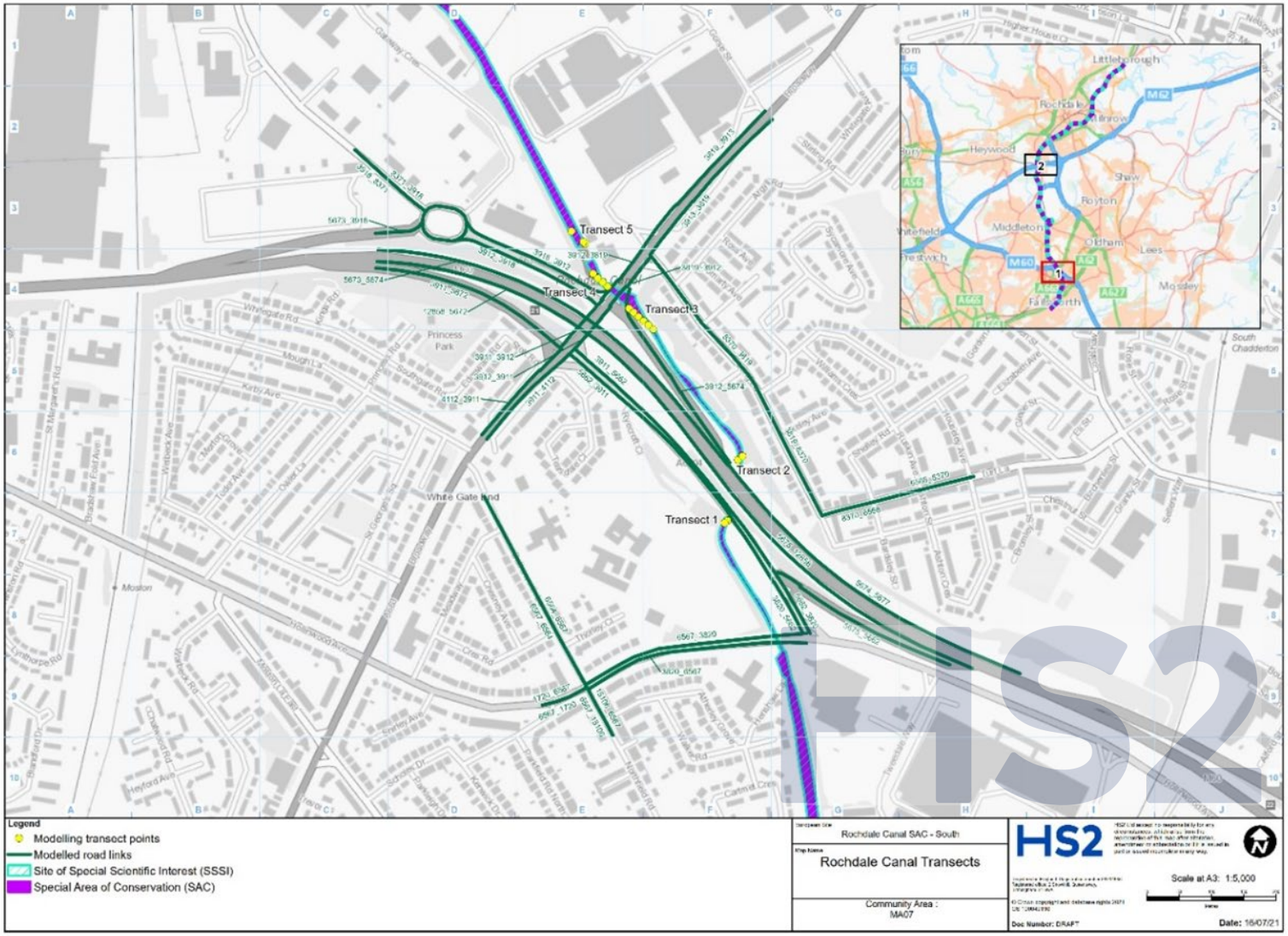
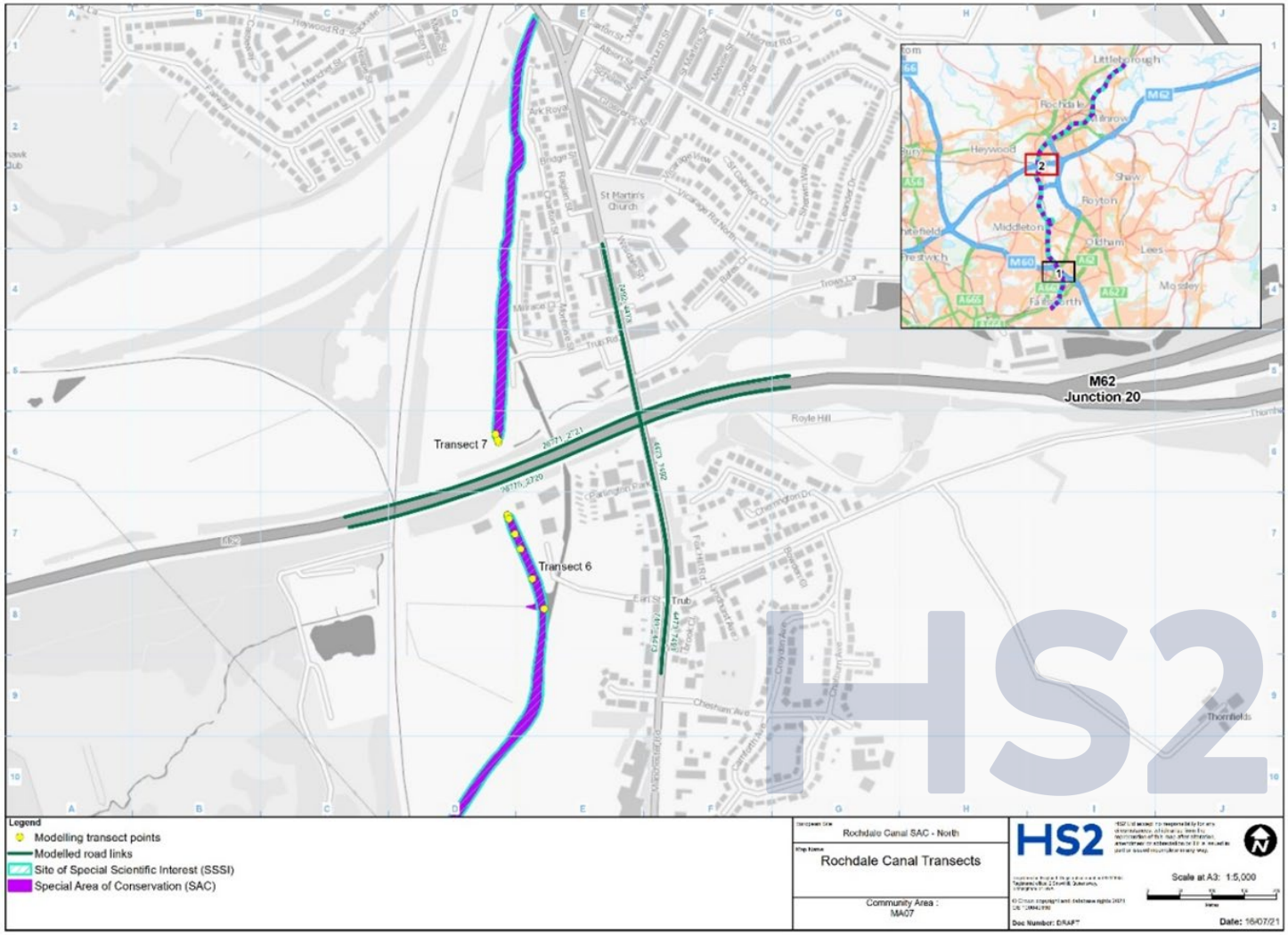


Figure 5: Map of Rochdale Canal SAC, M62, Transects 6 and 7



3.4.10 Reflecting the number of roads within 200m of the SAC, seven transects were established to capture the worst-case scenarios. Transects 1-5 are located at points around the M60 junctions 21and 22/A663 intersection (see Figure 4), whilst 6-7 are located where the canal passes underneath the M62 (see Figure 5). Each transect extends for a distance of 200m from the kerbside of each road or edge of the inside carriageway on a motorway. Given the differing circumstances of each location, each intercepts the canal at a different point on the transect. Because transects are straight, bends in the canal or the alignment of roads can compromise the ability to model deposition along a 200m section of the canal. This is the case at Transect 4; however, when used with Transect 5 nearby, an almost complete 200m section can be modelled.

3.4.11 The air pollution assessment has used traffic data based on an estimate of the average daily flows in the peak year during the construction period and adopts vehicle emission rates and background pollutant concentrations from the first year of construction. It should be noted that the air quality model takes a conservative approach and assumes that the highest flows in any one year are applied to the entire construction period. In reality, there will be considerable periods, perhaps years, where traffic flows and hence nitrogen deposition are less than this. However, the approach adopted meets the precautionary principle embedded in the Habitats Regulations.

3.4.12 Background NO_x and nitrogen deposition rates were obtained from the Air Pollution Information System (APIS)[25]. APIS also confirms that the critical load for *Luronium natans* is 3kg N/ha/yr – 10kg N/ha/yr. Following best practice, the lower value of 3kg N/ha/yr has been used in the air quality analysis. This is a precautionary measure that will emphasise any negative outcomes. Key outputs are summarised in Table 1 to Table 4 below and Annex A.

3.4.13 Table A5 of Annex A describes the change in NO_x concentrations brought about by the Proposed Scheme alone during construction. Whilst this is not repeated here, it interprets the data as follows:

> 'NO_x concentrations are predicted to be above the air quality standard at all modelled receptors in the baseline and future scenarios with the exception of Transect 6. In Transect 6 concentrations are below the standard beyond 150m from the road in 2018 and at all locations in 2025 (with or without the Proposed Scheme). The Proposed Scheme is not predicted to cause an exceedance of the air quality standard in any modelled locations.'

3.4.14 This has, in turn, prompted an analysis of nitrogen deposition across all transects. This is presented in Table 1[26] below (taken from Table A5 of Annex A).

[25] UK Centre for Ecology and Hydrology (2021), *Air Pollution Information System.* Available online at: http://www.apis.ac.uk/.

[26] Note that all tables in this HRA are drawn from Annex A. Whilst minor changes have been made to the layout, the data remains unchanged.

Table 1: Assessment of nitrogen deposition (construction, alone)

Tran-sect (T)	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2025 without the Proposed Scheme	2025 with the Proposed Scheme			
T1	4	32.11	31.07	31.08	<0.01	3	0.3%
	10	31.67	30.84	30.85	<0.01	3	0.3%
T2	10	34.55	32.53	32.57	0.04	3	1.3%
	20	33.4	31.84	31.87	0.03	3	1.0%
T3	0	35.04	32.79	32.84	0.05	3	1.7%
	10	33.75	32.02	32.06	0.03	3	1.2%
	20	33.31	31.77	31.80	0.03	3	1.0%
	30	33.05	31.63	31.65	0.03	3	0.9%
	40	32.87	31.52	31.55	0.02	3	0.8%
	50	32.72	31.44	31.46	0.02	3	0.8%
T4	0	36.18	33.27	33.36	0.09	3	3.2%
	10	34.27	32.22	32.27	0.05	3	1.7%
	20	33.53	31.82	31.86	0.04	3	1.3%
	30	33.1	31.60	31.63	0.03	3	1.1%
T5	71	31.8	30.91	30.92	0.02	3	0.5%
	75	31.75	30.88	30.90	0.02	3	0.5%
	100	31.53	30.77	30.78	0.01	3	0.4%
T6	43	24.83	24.19	24.20	<0.01	3	0.2%
	50	24.68	24.11	24.11	<0.01	3	0.2%
	75	24.27	23.87	23.88	<0.01	3	0.1%
	100	24.04	23.74	23.75	<0.01	3	<0.1%
	150	23.79	23.61	23.61	<0.01	3	<0.1%
	200	23.67	23.54	23.54	<0.01	3	<0.1%
T7	36	26.59	25.23	25.24	0.01	3	0.4%
	40	26.38	25.11	25.12	0.01	3	0.4%
	50	25.94	24.85	24.85	<0.01	3	0.3%

3.4.15 With reference to this data, Annex A states:

> 'Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. The changes in nitrogen deposition due to the Proposed Scheme are predicted to be above 1% of the relevant critical load in Transects 2, 3 and 4 (up to approximately 40m from the nearest road). Potentially significant effects are therefore predicted within these areas...'.

3.4.16 In reality, the individual loads brought about by construction alone are relatively modest. However, they all add further nitrogen to a system where baseline rates of deposition already exceed the critical load (by a factor of ten). Other than for parts of Transects 2, 3 and 4, all other exceedances as a result of construction alone were below 1%. Exceedances of 1% or above were restricted to the first 20m in Transects 2 and 3, and first 30m in Transect 4, though they would still lie two orders of magnitude below the 1% threshold where significant effects might (but are not guaranteed to) arise. In contrast, Transects 1, 5, 6 and 7 would not experience significant effects alone, as deposition rates would be less than 1%, or three orders of magnitude below the threshold. Whilst Transects 1 and 5 lie elsewhere in the A60/A633 intersection, Transects 6 and 7 apply solely to the M62.

3.4.17 Mindful of the air quality objective in the supplementary advice to 'restore as necessary …', and given that background levels of nitrogen deposition exceed critical loads, the conservation objectives must shift from the maintenance of the qualifying features to its restoration to a favourable conservation status.

3.4.18 Importantly though, the third, fourth and fifth columns of Table 1 show that at all transect points the rate of nitrogen deposition will be lower than at present with or without the Proposed Scheme.

Screening opinion for construction phase alone

3.4.19 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is a credible risk that nitrogen deposition at Transects 2, 3 and 4 from the construction phases alone could undermine the conservation objectives of Rochdale Canal and likely significant effects cannot be ruled out (alone). In contrast, likely significant effects alone can be ruled out for Transects 1, 5, 6 and 7. An in-combination assessment is required[27].

3.5 Construction screening assessment (in combination)

Rationale

3.5.1 Although likely significant effects during construction alone were ruled out, an assessment of the Proposed Scheme during construction in combination with other plans or projects is also

[27] Best practice suggests that where likely significant effects can be identified alone, an in-combination assessment of the same is not necessary and it can proceed to appropriate assessment alone. However, in this case, given the range of outcomes around each transect, it has been decided to subject all transects to an in-combination assessment as well to give a more complete picture of the factors affecting the European site. This would still meet the requirements of the Wealden decision.

required. As the Directive[28] makes clear, the in-combination test seeks to identify cumulative effects, and consequently they are limited to those that can affect the same feature. Therefore, the in-combination assessment was limited to those plans or projects that had the potential to increase nitrogen deposition on the qualifying features of Rochdale Canal; all other potential impacts were ruled out. The range and scope of in-combination assessments has been addressed in various settings; relevant examples include:

- In addition, Regulation 63(2) states:

  [the developer] 'must provide such information as the competent authority may reasonably require for the purposes of such an assessment.'
- Furthermore, on 22 April 2005, the European Commission stated, in response to a parliamentary question (P-0917/05):

  'The [in-] combination provision must be applied in a manner that is proportionate …'
- In Foster and Langton[29], the Court stated:

  'There is no basis to carry out an assessment of the in-combination effects when there are no effects to take into account.' (paragraph 36).

Methodology

3.5.2 In-combination effects are largely taken into account in the traffic data used for the assessment which incorporates likely changes brought about by other proposed and committed developments. The approach to this assessment, which has been agreed with Natural England, is provided in Section 2 of Annex A.

3.5.3 In order to comply with the Wealden decision, the scope of the in-combination assessment has been limited to those plans or projects that could contribute to a cumulative increase in air pollution at Rochdale Canal. Annex A details how development that could cause traffic emission related in-combination effects have been accounted for within the traffic data used in the air quality assessment of traffic flows. Searches were also carried out for the following non-traffic related emission sources (which are also included in the air quality model) within a 5km radius:

- combustion and energy >1MW;
- farming, livestock and poultry (any);
- waste, e.g. landfill gas (any); and
- minerals activities.

3.5.4 This is considered to be reasonable and proportionate and meets the expectations laid down in Section 4.48 of Natural England's guidance[21].

[28] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna (1992).

[29] R (Foster and Langton) v Forest of Dean DC and Homes and Communities Agency (2015), High Court of Justice, EWHC 2684.

Air quality assessment of traffic flows

3.5.5 Roads investigated under this scenario are:

- M60 junction 21 to junction 22;
- M60 junction 21 southbound on-slip;
- M60 within junction 21;
- A663 Broadway; and
- M62 junction 19 to junction 20.

3.5.6 Further roads have been included in the assessment to account for their emissions at receptors nearby. The outcomes of this exercise are presented in Table 2 below. As with the assessment of the Proposed Scheme alone, changes in NO_x are summarised first and reference to Table A7 of the Annex encouraged for the detail. The Annex states:

> 'NO_x concentrations are predicted to be above the air quality standard at all modelled receptors in the baseline and future scenarios with the exception of Transect 6. In Transect 6 concentrations are below the standard beyond 150m from the road in 2018, and at all locations in 2025 (with or without the Proposed Scheme).' The Proposed Scheme in combination with other plans and projects is not predicted to cause an exceedance of the air quality standard in any modelled locations.'

3.5.7 In turn, this prompted an analysis of nitrogen deposition across all transects. This is presented in Table 2 below. Exceedances of greater than 10% of the nitrogen deposition critical load for *Luronium natans* are highlighted in bold.

Table 2: Nitrogen deposition (construction, in-combination)

Transect (T)	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2025 do nothing	2025 with the Proposed Scheme			
T1	4	32.11	31.01	31.08	0.07	3	2.4%
	10	31.67	30.79	30.85	0.06	3	2.1%
T2	10	34.55	32.35	32.57	0.22	3	7.4%
	20	33.40	31.71	31.87	0.16	3	5.5%
T3	0	35.04	32.63	32.94	0.31	3	**10.2%**
	10	33.75	31.90	32.15	0.25	3	8.4%
	20	33.31	31.66	31.90	0.24	3	7.9%
	30	33.05	31.52	31.75	0.23	3	7.6%
	40	32.87	31.42	31.65	0.23	3	7.4%
	50	32.72	31.35	31.56	0.21	3	7.2%
T4	0	36.18	33.24	33.46	0.22	3	7.4%

Transect (T)	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2025 do nothing	2025 with the Proposed Scheme			
	10	34.27	32.16	32.37	0.21	3	6.8%
	20	33.53	31.76	31.96	0.20	3	6.6%
	30	33.10	31.54	31.73	0.19	3	6.3%
T5	71	31.80	30.86	31.02	0.16	3	5.2%
	75	31.75	30.84	30.99	0.15	3	5.2%
	100	31.53	30.73	30.88	0.15	3	5.0%
T6	43	24.83	24.04	24.20	0.16	3	5.2%
	50	24.68	23.97	24.11	0.14	3	4.6%
	75	24.27	23.78	23.88	0.10	3	3.1%
	100	24.04	23.68	23.75	0.07	3	2.3%
	150	23.79	23.57	23.61	0.04	3	1.3%
	200	23.67	23.51	23.54	0.03	3	0.9%
T7	36	26.59	24.91	25.24	0.33	3	**11.2%**
	40	26.38	24.80	25.12	0.32	3	**10.5%**
	50	25.94	24.59	24.85	0.26	3	8.9%

3.5.8 With reference to this data, Annex A states:

> 'Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios. Predicted nitrogen deposition rates in 2025, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition due to the Proposed Scheme in combination with other plans and projects are predicted to be above 1% of the relevant critical load in all Transects. Potentially significant effects are therefore predicted within these areas...'.

3.5.9 Table 2 makes it clear that during construction, the Proposed Scheme in combination with other Plans or Projects would result in exceedances above the 1% threshold in greater magnitude and across a greater area than the Proposed Scheme alone. No discrete locations, such as the M62 are exempt from this impact. However, as with the assessment alone, although the degree of exceedance is greater, all bar two (in Transect 7) still lie two orders of magnitude below the threshold where adverse effects might (but are not guaranteed to) arise. However, it is clear, that likely significant effects cannot be ruled out during construction, in combination. Of note are those within Transect 7 (adjacent to the M62) and Transect 3 (adjacent to the A663 Broadway) where increases of (just over) 11% and 10% arise respectively, are of particular concern. Approximately 9% increases at 50m on Transect 7 and 7% at 50m on Transect 3 from the road is evidence of a widespread increase in the nitrogen load.

3.5.10 Importantly though, the third, fourth and fifth columns to the table show that at all transect points, the rate of nitrogen deposition will be lower than at present with or without the scheme and with or without growth from other development in the foreseeable future.

Screening opinion for Rochdale Canal during construction in combination

3.5.11 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is a credible risk that nitrogen deposition from the construction phase could undermine the conservation objectives of Rochdale Canal and likely significant effects cannot be ruled out (in combination). An appropriate assessment is required (in combination).

3.6 Operational screening assessment (alone)

3.6.1 The same tasks, according to the same criteria as for the screening assessment for construction alone (see Section 3.4), were carried out for the operational phase and so they are not repeated here.

3.6.2 The only road meeting the criteria under this scenario was the A663 Broadway. The outcomes of this exercise are presented in Table 3 below. As with previous assessments, changes in NO_x are summarised first and reference to Table A13 of Annex A should be referred to for the detail. The Annex states:

> 'In the 2018 Baseline scenario, NO_x concentrations are above the air quality standard at all modelled locations except beyond 150m from the nearest road in Transect 6. By 2038 concentrations are only above the standard within approximately 10m of the nearest roads in Transects 2, 3 and 4.'

3.6.3 It is clear that post-construction increases in NO_x, as a consequence of the Proposed Scheme alone, are modest. Table 3 (taken from Table A13 of Annex A) below summarises the changes in nitrogen deposition though further detail is provided in Annex A.

Table 3: Nitrogen deposition (operational, alone)

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2038 without the Proposed Scheme	2038 with the Proposed Scheme			
Rochdale Canal SSSI and SAC Transect 1	4	32.11	30.41	30.42	<0.01	3	<0.1%
	10	31.67	30.32	30.32	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 2	10	34.55	31.01	31.02	<0.01	3	0.2%
	20	33.40	30.72	30.73	<0.01	3	0.1%
Rochdale Canal SSSI and SAC Transect 3	0	35.04	31.17	31.17	<0.01	3	<0.1%
	10	33.75	30.83	30.83	<0.01	3	<0.1%
	20	33.31	30.72	30.72	<0.01	3	<0.1%
	30	33.05	30.65	30.65	<0.01	3	<0.1%
	40	32.87	30.61	30.61	<0.01	3	<0.1%
	50	32.72	30.57	30.57	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 4*	0	36.18	31.52	31.45	<0.01	3	<0.1%
	10	34.27	30.98	30.95	<0.01	3	<0.1%
	20	33.53	30.79	30.77	<0.01	3	<0.1%
	30	33.10	30.68	30.66	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 5 *	71	31.80	30.36	30.36	<0.01	3	<0.1%
	75	31.75	30.35	30.35	<0.01	3	<0.1%
	100	31.53	30.30	30.30	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 6 *	43	24.83	23.70	23.70	<0.01	3	<0.1%
	50	24.68	23.67	23.67	<0.01	3	<0.1%
	75	24.27	23.58	23.57	<0.01	3	<0.1%
	100	24.04	23.52	23.52	<0.01	3	<0.1%

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2038 without the Proposed Scheme	2038 with the Proposed Scheme			
	150	23.79	23.47	23.47	<0.01	3	<0.1%
	200	23.67	23.44	23.44	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 7 *	36	26.59	24.13	24.13	<0.01	3	<0.1%
	40	26.38	24.08	24.07	<0.01	3	<0.1%
	50	25.94	23.97	23.97	<0.01	3	<0.1%

*Notes: * indicates that points in this transect cause a reduction in concentrations as a result of the Proposed Scheme – alone and therefore these Transects are not considered within the Proposed Scheme – in combination*

3.6.4 Annex A states:

> 'Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. The changes in nitrogen deposition due to the Proposed Scheme are predicted to be below 1% of the relevant critical load in all locations and therefore no potentially significant effects are predicted.'

3.6.5 Whilst it is acknowledged that critical loads are already exceeded by a factor of ten, in clear contrast to the construction phase, increases in domestic traffic displaying driving behaviours influenced by the Proposed Scheme, but unrelated to it, are extremely modest; three orders of magnitude below the threshold where significant effects may arise. Almost all modelled points indicate increases of less than 0.1% of the minimum critical load, with the greatest increase of 0.2% occurring at one point on Transect 2. Consequently, likely significant effects can be ruled out for the operational phase, alone.

3.6.6 Importantly though, the third, fourth and fifth columns to the table show that, at all transect points, the rate of nitrogen deposition will be lower than at present with or without the scheme.

Screening opinion for operational phase alone

3.6.7 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is no credible risk across all transects that nitrogen deposition from the operational phase could undermine the conservation objectives of Rochdale Canal and likely significant effects can be ruled out (alone). There is no need for an appropriate assessment (alone). However, mindful of the Wealden decision, the impact of the Proposed Scheme must be assessed in combination with other plans or projects.

3.7 Operational screening assessment (in combination)

3.7.1 The same tasks according to the same criteria and case law as for the screening assessment for construction in combination (see Section 3.5), were carried out for the operational phase and are not repeated here.

3.7.2 Roads investigated under this scenario are:

- M60 junction 21 to junction 22;
- M60 junction 21 southbound on-slip;
- M60 within junction 21;
- A663 Broadway; and
- M62 junction 19 to junction 20.

3.7.3 The outcomes of this exercise are presented in Table 4 below. As with previous assessments, changes in NO_x are summarised first and Table A16 of Annex A should be referred to for the detail. The Annex states:

> 'In the 2018 Baseline scenario, NO_x concentrations are above the air quality standard at all modelled locations except beyond 150m from the nearest road in Transect 6. By 2038 concentrations are above the standard within approximately 10m of the nearest roads in Transects 2 and 3 and potentially significant increases in NO_x are predicted as a result of the Proposed Scheme in combination with other plans and projects at these locations.'

3.7.4 It should also be noted that significant impacts do not arise on Transects 4 and 5. Table 4 below summarises the changes in nitrogen deposition though further detail is provided in Annex A (Table A16).

Table 4: Operational screening (in-combination)

Tran-sect (T)	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2038 do nothing	2038 with the Proposed Scheme			
T1	4	32.11	30.37	30.42	0.05	3	1.5%
	10	31.67	30.28	30.32	0.04	3	1.3%
T2	10	34.55	30.88	31.02	0.14	3	4.6%
	20	33.40	30.63	30.73	0.10	3	3.3%
T3	0	35.04	31.07	31.27	0.20	3	6.6%
	10	33.75	30.75	30.93	0.18	3	5.8%
	20	33.31	30.65	30.81	0.16	3	5.6%
	30	33.05	30.59	30.75	0.16	3	5.5%
	40	32.87	30.54	30.71	0.17	3	5.4%
	50	32.72	30.51	30.67	0.16	3	5.3%

3.7.5 With reference to this data, Annex A states:

> 'Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. Predicted nitrogen deposition rates in 2038, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition due to the Proposed Scheme in combination with other plans and projects are predicted to be above 1% of the relevant critical load at a number of locations in all Transects. Potentially significant effects are therefore predicted within these areas'.

3.7.6 Again, it is clear that during operation, the Proposed Scheme in combination with other Plans or Projects would result in exceedances above the 1% threshold to a far greater extent in terms of magnitude and area than the Proposed Scheme alone. No discrete location is

exempt from this impact with the greatest increase equivalent to, 6.6% of the critical load on Transect 3. It is therefore clear, that likely significant effects cannot be ruled out during operation, in combination.

3.7.7 Importantly though, the third, fourth and fifth columns to the table show that at all transect points the rate of nitrogen deposition will be lower than at present with or without the scheme and with or without growth from other development in the foreseeable future.

Screening opinion for operational phase in combination

3.7.8 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is a credible risk across all transects that nitrogen deposition from the operational phase could undermine the conservation objectives of Rochdale Canal and likely significant effects cannot be ruled out (in combination). An appropriate assessment (in combination) is required.

4 Appropriate assessment and integrity test

4.1 The appropriate assessment test

4.1.1 The appropriate assessment is defined in Regulation 63(5). The following definitions are applied as necessary to the subsequent assessment of likely significant effects.

4.1.2 Regulation 63(5) states where a project is 'likely to have a significant effect alone or in combination', it can only be consented if the competent authority can ascertain (following an appropriate assessment) that it 'will not adversely affect the integrity of the European site'. Drawing on Waddenzee, the *'in-combination test'* is also carried forward into the appropriate assessment.

4.1.3 In Sweetman[30], 'integrity' is defined as:

> … 'the lasting preservation of the constitutive characteristics of the site … whose preservation was the objective justifying the designation of the site'.

4.1.4 In the Advocate General's opinion on the above case (Sweetman)[31], she stated that a plan or project involving '… some strictly temporary loss of amenity which is capable of being fully undone …' would avoid an adverse effect on the integrity of a site. This was supported by the Court which ruled that '… the lasting and irreparable loss…' of part of a European site would represent an adverse effect on its integrity.

4.1.5 In Planning Practice Guidance[4] 'integrity' is described as:

> '… the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated.'

4.1.6 The burden of proof is made clear in Waddenzee and where:

> '… doubt remains as to the absence of adverse effects … the competent authority will have to refuse authorisation'[32] [and] 'that is the case where no reasonable scientific doubt remains as to the absence of such effects'[33].

4.1.7 However, absolute certainty is not required. In Champion, whilst referring to Advocate General Kokott in Waddenzee at paragraph 107, the Supreme Court found that:

> '… absolute certainty' is not required as: '… the necessary certainty cannot be construed as meaning absolute certainty since that is almost impossible to attain …'.

[30] Sweetman v An Bord Pleanála (C 258-11) [2014] PTSR 1092 at paragraph 39.

[31] Advocate General Opinion in Case C-258/11 Sweetman paragraphs 58-61.

[32] Waddenzee at paragraph 57.

[33] Waddenzee at paragraph 59.

4.2 Appropriate assessment

Assessment

4.2.1 The screening assessment ruled out likely significant effects for the operational phase, alone and no appropriate assessment is required. In contrast, it identified that likely significant effects could not be ruled out for the following phases:

- construction – alone;
- construction – in combination; and
- operation – in combination.

4.2.2 Although differences are evident regarding the reasons for and the impact of each of the above three scenarios, a range of common factors persist including relatively modest contributions of nitrogen alone, though of a greater magnitude when combined with other plans or projects. The status of *Luronium natans*, its distribution within the canal, the suitability of the critical load and other factors are discussed below and should be taken to apply to all scenarios and locations.

Nitrogen deposition

4.2.3 The screening assessment has shown that, during construction, likely significant effects cannot be ruled out either alone and in combination, nor during operation, in combination with other plans or projects. Consequently, an appropriate assessment was required for each of these three scenarios. To avoid any doubt, likely significant effects were ruled out during operation alone.

4.2.4 The analysis complies with the Wealden decision and no small or *de minimis* impacts have been excluded from the analysis; full account has also been taken of other plans or projects. The outcomes are provided in Section 3. In all scenarios, except the impact from the operational phase alone, critical loads were consistently exceeded at the locations analysed in both in-combination assessments, though impacts were more modest under construction alone. Typically, exceedances in single digits were observed though this increased to approximately 10% - 11% near the M62 during construction, in combination. Whilst markedly above the 1% threshold these all lie two or one order of magnitude respectively below the critical load where harmful effects may (though are not guaranteed to) arise.

4.2.5 Reliance on exceedances alone though can be misleading. To undertake the assessment, the presence or otherwise of *Luronium natans* also needs to be taken into account, as does the suitability of the habitat in proximity to the relevant roads However, more subtle impacts may be at play. Whilst it is a dynamic system with a modest flow that would allow the exchange of genetic material, excessive nitrogen deposition along the 1km stretch of canal at the M62/A663 intersection could effectively sterilise this section from ever supporting this species. Whilst perhaps unlikely, this could sever the populations of the canal making each

more vulnerable; it is noted that with much reproduction by vegetative means the community is dominated by clones and is, accordingly, more vulnerable.

4.2.6 In addition, the water chemistry of the SAC is not known and so it is unclear if the system is limited by phosphates or nitrates. If the latter, the addition of more nitrogen could prompt algal blooms or the growth of a more aggressive emergent flora; *Luronium natans* is considered vulnerable to this. Other negative synergies cannot be ruled out. In contrast, if phosphate is limited, the increase in nitrogen could be considered to be of little consequence.

4.2.7 Yet, increased deposition is only a factor at two discrete locations and exceedances, though noticeable, remain relatively modest. Fundamentally though, and reflecting reasonably anticipated improvements in engine technology, the third, fourth and fifth columns of Table 1 to Table 4 above, in all scenarios alone or in combination and at all transect points, show clearly that the rate of nitrogen deposition will be lower than at present with or without the scheme and with or without growth from other foreseeable future development. The Proposed Scheme does not reverse this trend though does slow the rate of improvement. In these circumstances, the impact of the Proposed Scheme could be considered temporary and reversible, further reducing the potential for an adverse effect.

4.2.8 Indeed, such an outcome would comply with section 5.43 of Natural England's guidance which, whilst addressing significant effects states that '… it may be possible to consider some increases as temporary and reversible, which would be unlikely to undermine site objectives.' Such an approach would also be supported by case law including Sweetman and Waddenzee (see Section 4.1).

4.2.9 However, at present, the lack of understanding of the water chemistry ensures that uncertainty remains. Whilst this could be resolved by further research, until such time as this becomes available, this potentially positive outcome cannot be relied upon in this HRA at this moment in time and adverse effects cannot be ruled out.

Status, characteristics and distribution of *Luronium natans*

4.2.10 *Luronium natans* is a nationally scarce (i.e. found in less than fifteen 10km squares across the country) emergent, aquatic plant that is endemic in Europe; England and Wales supports a large proportion of the global population. Eutrophication, turbidity and boat traffic are all considered to represent current threats. Though UK populations are currently considered stable (in the short-term)[34], this follows on from a considerable period of decline.

[34] Joint Nature Conservation Committee (2019). European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC). Fourth Report by the United Kingdom under Article 17. Supporting documentation for the conservation status assessment for the species: S1831 – Floating water-plantain (*Luronium natans*).

4.2.11 It is most closely associated with the Annex 1 habitat '3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojunceata'*, and is typically found in naturally-fluctuating, 2m deep or shallower, mesotrophic water bodies. It is thought its natural distribution was centred on the nutrient poor meres and other water bodies of North Wales and north-west Cheshire. Construction of the canal network (in the 17th and 18th centuries) appears to have allowed its expansion eastwards to the extent that 50% of all records post-1980 now arise from these artificial, and typically more mesotrophic and slow flowing, water bodies.

4.2.12 Populations appear to be more stable at natural sites, as they are considered vulnerable to dredging, channel straightening and pollution. Indeed, some consider the species 'disappears' when a canal is restored to navigation and boat traffic increases above a very low level[35]. Similarly, it is considered to be intolerant of competition and scour or wave action. Despite considerable research, there appears to be conflicting evidence regarding its tolerance of both nutrient poor and nutrient rich waters with the latter prompting competition from more aggressive species. Similarly, there is competing evidence regarding its ability to tolerate acidic or more neutral watercourses[36].

4.2.13 There is greater consensus of its ability to exist as a series of dynamic metapopulations as a function of adopting two growth forms (floating oval leaves in shallow water and submerged rosettes where deeper) and, more influentially, employing a range of reproductive strategies including possibly prolonged dormancy[37]. It is considered 'notoriously difficult' to identify, potentially leading to both under- and over-recording.

4.2.14 Natural England[38] has recently explored the distribution and abundance of *Luronium natans* in the canal north of the M62. Though *Luronium natans* was found intermittently, though especially in refuge areas 'fenced' off from the main channel to reduce the impact of boat traffic, the survey applied specifically to those stretches of the canal north of the M62 and the outcomes cannot be applied to the canal south of the M62. There is no contemporary evidence of the distribution of *Luronium natans* south of the M62, with the only publicly available data contained in the FCT[39]. This provides evidence from a series of annual surveys carried out along the entire SAC between 2003 to 2006 which described a widespread but fragmented distribution that also varied over time. The locations where *Luronium natans* was found are shown in Figure 6.

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[35] Lockton, A.J. (2021), Species account: *Luronium natans.* Botanical Society of the British Isles. Available online at: http://sppaccounts.bsbi.org/content/luronium-natans.html.

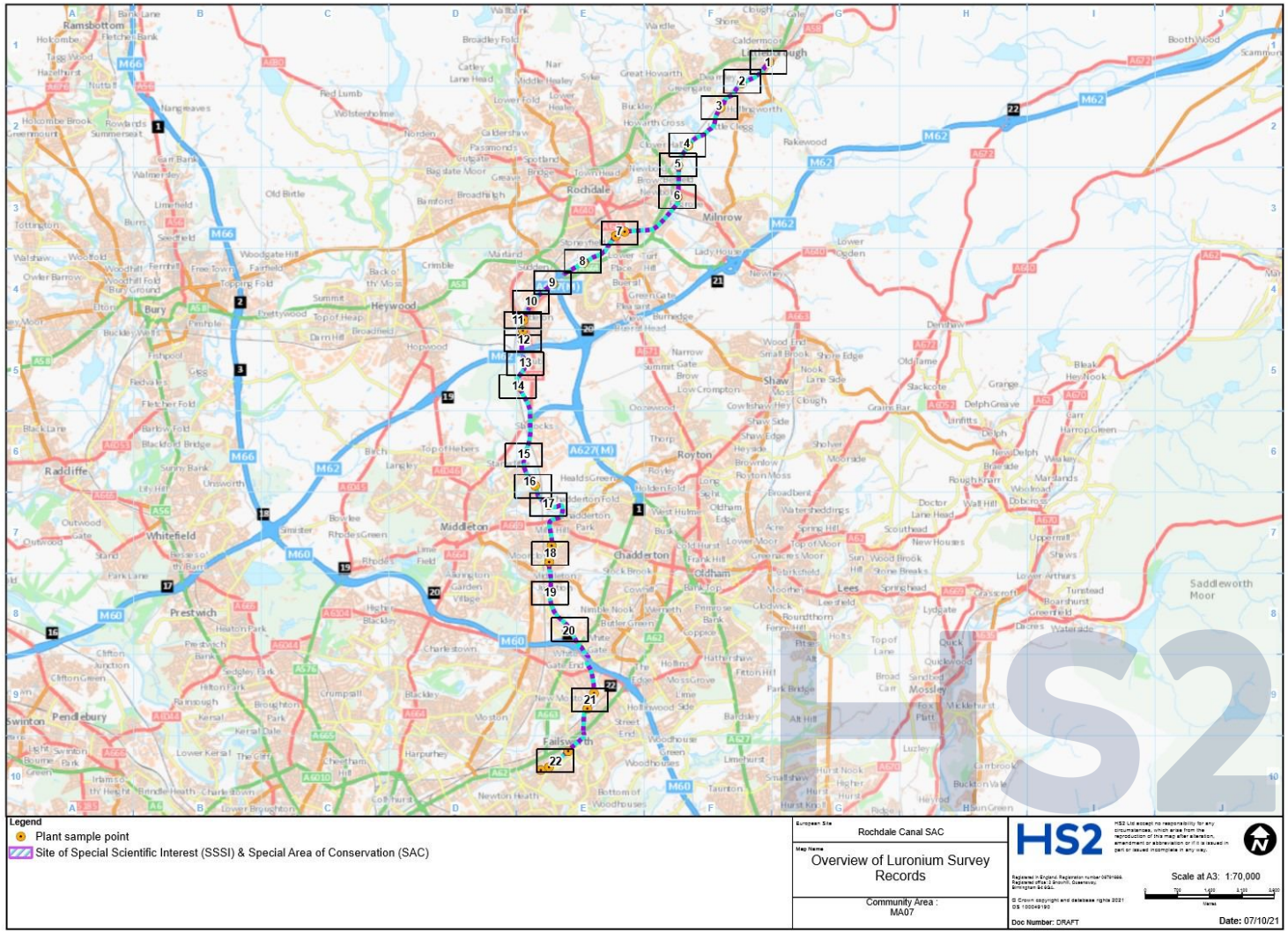
[36] Lansdown, R. V. and Wade, P. M. (2003), *Ecology of the Floating Water-plantain*. Conserving Natura 2000 Rivers Ecology Series No. 9.

[37] Joint Nature Conservation Committee (2021), Species account for *Luronium natans*. Available online at: https://sac.jncc.gov.uk/species/S1831/.

[38] Natural England (2017), *Notes on site visit to Rochdale Canal 5 July 2017 (unpublished).*

[39] Natural England (2012), *Definition of Favourable Condition for designated features of interest Rochdale Canal SSSI*.

Figure 6: Distribution of *Luronium natans* in 2003 – 2006



4.2.15 Some trends were apparent though, including both the complete and persistent absence from the relatively recently constructed section of canal underneath the intersection of the M60 and A663 and, in contrast, its consistent presence in central Manchester and around the M62.

4.2.16 Observational surveys were completed to inform this reporting in 2021. Data is currently subject to analysis. However, preliminary interpretation appears to show that *Luronium natans* is abundant and widespread. In line with this, and on a precautionary basis it is assumed that *Luronium natans* is widespread throughout the entire canal and potentially vulnerable to increased rates of nitrogen deposition at all the locations identified above.

4.2.17 It is clear, therefore, that the *Luronium natans* communities of the Rochdale Canal form an important component of a scarce, national population where, given the growth in recreational boat traffic, perhaps 50% of its population is found in similarly vulnerable situations. Increased rates of nitrogen deposition represent a considerable, threat.

Critical loads

4.2.18 The critical load for *Luronium natans* is 3kg N/ha/yr - 10kg N/ha/yr. As a precautionary approach, best practice encourages use of the lower value in the range as this will emphasise any negative outcomes. Consequently, this approach and a value of 3kg N/ha/yr has been adopted throughout the air quality analysis. However, APIS adds that:

> 'the lower end of the range is intended for boreal and alpine lakes and the higher end for of the range for Atlantic softwaters'.

4.2.19 Whilst it is clear that the Rochdale Canal does not represent a boreal or alpine lake, it is supplied in its highest reaches by oligotrophic waters providing some justification for the use of the lower critical load. However, it is also supplied by more nutrient rich lowland waters and is frequently described as mesotrophic, with the SSSI citation highlighting areas of localised enrichment, a pattern reflected in the diversity of the flora present.

4.2.20 These circumstances potentially provide grounds to justify the use of the higher critical load. Were the 10kg N/ha/yr value to be used in the air quality model, deposition rates would fall by a third (approximately). The impact on the SAC would be reduced accordingly and could allow a more positive outcome.

4.2.21 Further research could clarify these matters but at present, the contemporary nutrient status and water chemistry of the SAC remains unknown. Consequently, best practice demands that the lower value is used, and the outcomes must remain unchanged.

4.3 Mitigation

4.3.1 At present, and at this stage of the design process, no additional mitigation is proposed that would reduce the rate of nitrogen deposition[40]. Further assessment will be carried out in accordance with Article 6(3) of the Habitats Directive. Documents to inform the appropriate assessment for the Rochdale Canal SAC will be made available to Parliament prior to approval of the hybrid Bill.

4.4 Integrity test for Rochdale Canal

4.4.1 The Proposed Scheme has been subjected to an appropriate assessment for the purposes of Regulation 63 of the Habitats Regulations 2017, as amended. It is considered that the competent authority is not able to ascertain that an adverse effect on the integrity of the site will not arise alone or in combination.

4.4.2 This is because there is uncertainty surrounding the water chemistry of the canal and the distribution of *Luronium natans*. Together, these provided sufficient uncertainty that ensured that neither the requirements of the conservation objectives to restore the structure and function and supporting processes of the SAC, nor the more detailed objectives embedded in the Supplementary Advice could be met. No mitigation has been proposed.

[40] The assessment incorporates HS2 Ltd's policy on vehicle emissions during construction as follows: use of Euro VI Heavy Goods Vehicles (HGVs), Euro 4 petrol and Euro 6 diesel cars and Light Goods Vehicles (LGVs).

5 Conclusions

5.1.1 This document provides relevant information to enable a HRA to be carried out for the purposes of Regulation 63 of the Habitats Regulations 2017, as amended, should one be required. The outcomes allow the following conclusions to be drawn:

- it is considered there is a credible risk that nitrogen deposition, during construction of the Proposed Scheme, alone could undermine the conservation objectives of Rochdale Canal SAC and likely significant effects alone could not be ruled out. Therefore, it is considered an appropriate assessment is required (alone);
- it is considered there is a credible risk that nitrogen deposition, during construction of the Proposed Scheme, in combination, could undermine the conservation objectives of Rochdale Canal SAC and likely significant effects could not be ruled out. Therefore, it is considered an appropriate assessment is required (in combination);
- it is considered there is no credible risk that nitrogen deposition, during operation of the Proposed Scheme, alone, could undermine the conservation objectives of Rochdale Canal SAC and likely significant effects could be ruled out. Therefore, it is considered there is no need for an appropriate assessment (alone);
- it is considered there is a credible risk that nitrogen deposition during operation of the Proposed Scheme, in combination, could undermine the conservation objectives of Rochdale Canal SAC and likely significant effects could not be ruled out. Therefore, it is considered an appropriate assessment is required (in combination);
- it is considered the appropriate assessment is unable to ascertain that adverse effects on the integrity of the Rochdale Canal, during construction of the Proposed Scheme, alone, can be ruled out;
- it is considered the appropriate assessment is unable to ascertain that adverse effects on the integrity of the Rochdale Canal, during construction of the Proposed Scheme, in combination, can be ruled out;
- it is considered the appropriate assessment is unable to ascertain that adverse effects on the integrity of the Rochdale Canal, during operation of the Proposed Scheme, in combination, can be ruled out; and
- further assessment will be carried out in accordance with Article 6(3) of the Habitats Directive. Documents to inform the appropriate assessment for the Rochdale Canal SAC will be made available to Parliament prior to approval of the hybrid Bill.

Annex A: Additional air quality information to inform a Habitats Regulations Assessment

1 Purpose

This Annex provides additional air quality information in relation to impacts from vehicle emissions to support the document to inform a HRA for Rochdale Canal SAC.

2 Scope, assumptions and limitations

The scope, assumptions and limitations for the air quality assessment are set out in full in Volume 1 (Section 8), in the Environmental Impact Assessment SMR (see Volume 5: Appendix CT-001-00001) and accompanying SMR Technical note – Air quality: Guidance on the assessment methodology.

Key elements in relation to the assessment of vehicle emissions on ecologically sensitive sites are:

- screening of traffic data using the criteria set out in the SMR, which is based on the DMRB criteria[20], to identify where assessment is required; and
- these criteria are the following for assessing the impacts of the scheme alone:
  - change in road alignment by 5m or more;
  - change in daily traffic flows by 1,000 vehicles or more as AADT;
  - change in daily flows of HDV by 200 AADT or more;
  - change in daily average speed by 10kph or more; or
  - change in peak hour speed by 20kph or more.
- these criteria are the following for assessing the impacts of the scheme in combination with other plans and projects:
  - change in daily traffic flows by 1,000 vehicles or more as AADT; and
  - change in daily flows of HDV by 200 AADT or more.
- ecological receptors included in the air quality assessment are designated sites with habitats sensitive to NO_x deposition. These could include, SAC, SPA and Ramsar sites;
- transects have been used within a designated site with modelled points at 0m, 10m, 20m, 30m, 40m, 50m, 75m, 100m, 150m and 200m from the edge of the road. However, specific modelling points will be subject to the orientation of the site and nearby vehicle emission sources;
- a deposition velocity relevant to the habitat of each site has been used, as detailed in the IAQM ecological guidance[22]. Data on nitrogen deposition has been taken from the most recent information available on the APIS[25] website. No reduction in future background deposition rates has been applied;
- the following scenarios are assessed:
  - baseline;
  - selected year(s) within the construction period for the assessment of the effects of construction. The year(s) of assessment are selected based on the worse case peak period during the construction programme and on when significant effects might be expected; and

  - an operational scenario will be assessed for the first full operational year after construction is completed.

- for each assessment year, both the scenario without the Proposed Scheme in place and the scenario with the Proposed Scheme in place will be modelled. This comparison is used to assess the impacts of the Proposed Scheme alone;
- for the assessment of the Proposed Scheme in combination with other plans and projects, a different without scheme scenario is used and described as the 'do nothing' scenario. This uses traffic data from the 2018 baseline, but background pollutant concentrations/ deposition rates and emission factors representing the future year being assessed;
- the assessment incorporates HS2 Ltd's policy on construction vehicle emissions standards. These standards are published in Information Paper E31[41]; Air Quality and include Euro VI for HGV, and Euro 6 and Euro 4 for diesel and petrol Light-Duty Vehicle (LDV), respectively;
- in-combination effects are largely taken into account in the traffic data used for the assessment which incorporates likely changes brought about by other proposed and committed developments[42]; and
- consideration is also given to relevant non-road plans and projects.

[41] HS2 (2017), *High Speed Two Phase One Information Paper E31: Air Quality.* Version 1.5. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/672406/E31_-_Air_Quality_v1.5.pdf.

[42] A number of strategic traffic models have been sourced from key stakeholders, including Local Highway Authorities and Highways England. In combination, these models cover the areas that are expected to be affected by the proposed scheme and have been used as the basis of assessment for traffic flow analysis. The models have been developed by the relevant stakeholders in accordance with Transport Analysis Guidance (TAG) provided by the Department for Transport, with each model representing a base year position between 2016 and 2018.

Forecast year models have also been supplied by the above stakeholders which reflect committed and planned changes to the transport network and growth associated with committed and planned developments that are sufficiently certain to be introduced after the base year of the strategic model. Reviews of committed developments will have been undertaken by the relevant stakeholders at the same time as preparing and validating the base year model and developing future year models. Given that the models represent a base year position between 2016 and 2018, it is likely that the reviews of forecast committed developments will have been undertaken between 2016 and 2018 depending on when each model was last updated.

In order to account for traffic growth from 2018 to future years, growth factors were directly obtained from TEMPro version 7.2 which uses the National Trip End Model (NTEM 7.2 ((2017)) dataset and the National Transport Model (NTM) 2015. TEMPro inherently incorporates future planned development, being based on approved plans, irrespective of whether it is approved, committed, or simply included in approved plans. It includes all economic and population growth forecasts, and assumes growth in housing and commercial development, therefore providing a prediction of traffic growth by area.

3 Air quality standards

Air quality limit values and objectives are quality standards for clean air and to protect human health or harm to vegetation. The term 'air quality standards' will be used to refer to both the English air quality objectives and the air quality limit values and critical levels introduced in the UK based on EU Directives. Table A1 sets out the air quality standard for NO_x.

Table A1: Air quality standards

Pollutant	Averaging period	Standard
NO_x (for protection of vegetation)	Annual mean	30µg/m^3

For the assessment of changes in nitrogen, comparison has been made against the applicable lower critical load[43] for the site, as provided by APIS.

[43] The critical loads for nitrogen deposition vary and are specific to each qualifying feature. These are presented as a range of values (expressed as a rate, e.g., 10kg N/ha/yr - 20 kg N/ha/yr) and typically, as a precautionary approach, only the lowest value is used (unless there are compelling reasons to do otherwise) as this will emphasise any negative outcomes.

4 How significance is assessed

For the assessment of NO_x concentrations, the effect is considered to be not significant if the total predicted NO_x concentrations are below the air quality standard of 30µg/m^3.

For the assessment of nitrogen deposition, if the change in nitrogen deposition is predicted to be less than 1% of the lower critical load, then the effect is considered to be not significant. However, should the nitrogen deposition change by more than 1%, then the assessment of significance will be undertaken by an ecologist and reported within Section 3 of the main HRA report.

5 Assessment of construction traffic effects – Proposed Scheme alone

5.1 Screening of traffic data

The assessment of construction traffic impacts has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2025-2037). Traffic data is presented in Table A2.

The screening process identified a total of four roads in the area exceeding the screening thresholds. These roads include:

- M60 junction 21 to junction 22;
- M60 within junction 21;
- A663 Broadway; and
- M62 junction 19 to junction 20.

Further roads have been included in the assessment to account for their emissions at nearby receptors.

Table A2: Traffic data summary (construction phase)

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)	2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)
3912_3819, 3819_3912	A663 Broadway, north of M60 junction 21	46,173	45,773	46,930	**1,156**	757	1,794	1,999	1,998	-0	**204**
3913_3819, 3819_3913	A663 Broadway, north of M60 junction 21	41,163	40,682	41,835	**1,153**	671	1,580	1,784	1,784	-0	**204**
3918_3912, 3912_3918	A663 Broadway over M60 junction 21	9,453	9,727	10,194	467	741	463	515	511	-4	49
7492_4473, 4473_7492	A664 Manchester Road	18,412	19,385	19,373	-12	961	408	389	388	-0	-20
7491_4473, 4473_7491	A664 Manchester Road	18,412	19,385	19,373	-12	961	408	389	388	-0	-20
6567_6564, 6564_6567	Butterworth Lane	545	547	561	14	16	8	4	4	0	-4

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)	2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)
8370_6568, 6568_8370	Turf Lane	167	167	162	-4	-5	161	159	159	-0	-2
8370_3819, 3819_8370	Long Lane	5,036	5,135	5,137	3	101	240	253	253	-0	12
5662_3820, 3820_5662	A6104 Semple Way, Oldham	17,948	18,128	18,032	-97	84	318	274	275	1	-43
6567_3820, 3820_6567	A6104 Hollinwood Avenue	15,506	17,243	17,542	299	**2,036**	262	320	323	3	62
3911_3912, 3912_3911	A663 Broadway over M60 junction 21	37,652	37,830	37,835	5	183	1,353	1,447	1,452	5	99
5662_3911, 3911_5662	A6104 Semple Way, Oldham	11,271	11,450	11,359	-90	89	494	555	551	-4	57
4112_3911, 3911_4112	A663 Broadway, south of M60 junction 21	40,660	41,164	41,081	-83	421	1,003	1,038	1,049	11	46

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)	2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)
5675_5662	M60 junction 21 northbound offslip	17,342	17,601	17,629	28	287	305	290	287	-3	-18
3911_5672	M60 junction 21 northbound onslip	18,606	18,577	18,615	38	9	502	546	545	-1	43
12858_5672	M60 beneath junction 21	27,474	30,270	30,545	274	**3,071**	1,819	1,955	1,944	-11	125
3912_5674	M60 junction 21 southbound onslip	14,133	15,232	15,682	450	**1,549**	424	524	521	-3	97
5673_5674	M60 beneath junction 21	36,751	40,493	41,277	784	**4,526**	1,812	2,078	2,096	18	**284**
5674_5677	M60 junction 21 to junction 22	50,885	55,726	56,960	**1,234**	**6,075**	2,235	2,601	2,616	15	**381**
5675_12858	M60 junction 22 to junction 21	27,474	30,270	30,545	275	**3,071**	1,819	1,955	1,944	-11	125

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)	2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	Proposed Scheme alone change (2025 with the Proposed Scheme – 2025 without Proposed Scheme)	In-combination change (2025 with the Proposed Scheme – 2018 baseline)
5673_3918	M60 junction 21 southbound offslip	7,162	7,645	7,682	37	520	376	403	402	-1	26
8371_3918, 3918_8371	B6189 Broadgate	4,606	6,331	5,612	-719	**1,006**	208	246	244	-2	36
15106_6567, 6567_15106	Northfield Road	1,053	1,552	1,556	4	503	31	50	50	-0	20
6567_1720, 1720_6567	A6104 Hollinwood Avenue	14,808	15,504	15,905	400	**1,097**	233	266	270	3	37
2722_2720	M62 junction 19 to 20	60,784	74,799	75,848	**1,050**	**15,064**	6,713	7,525	7,537	12	**824**
2719_2721	M62 junction 19 to 20	61,004	73,116	73,326	211	**12,322**	6,873	7,382	7,337	-45	**464**

Note: Values in bold indicate change in traffic flow triggering for assessment.

5.2 Receptors assessed and background concentrations

Figure A1 and Figure A2 present detailed maps of the modelled area including assessed roads (road network in blue, haul roads in green) and modelled receptors (yellow dots).

Table A3 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads.

Figure A1: Map of Rochdale Canal Transects 1 to 5, including modelled links and modelled ecological receptor points

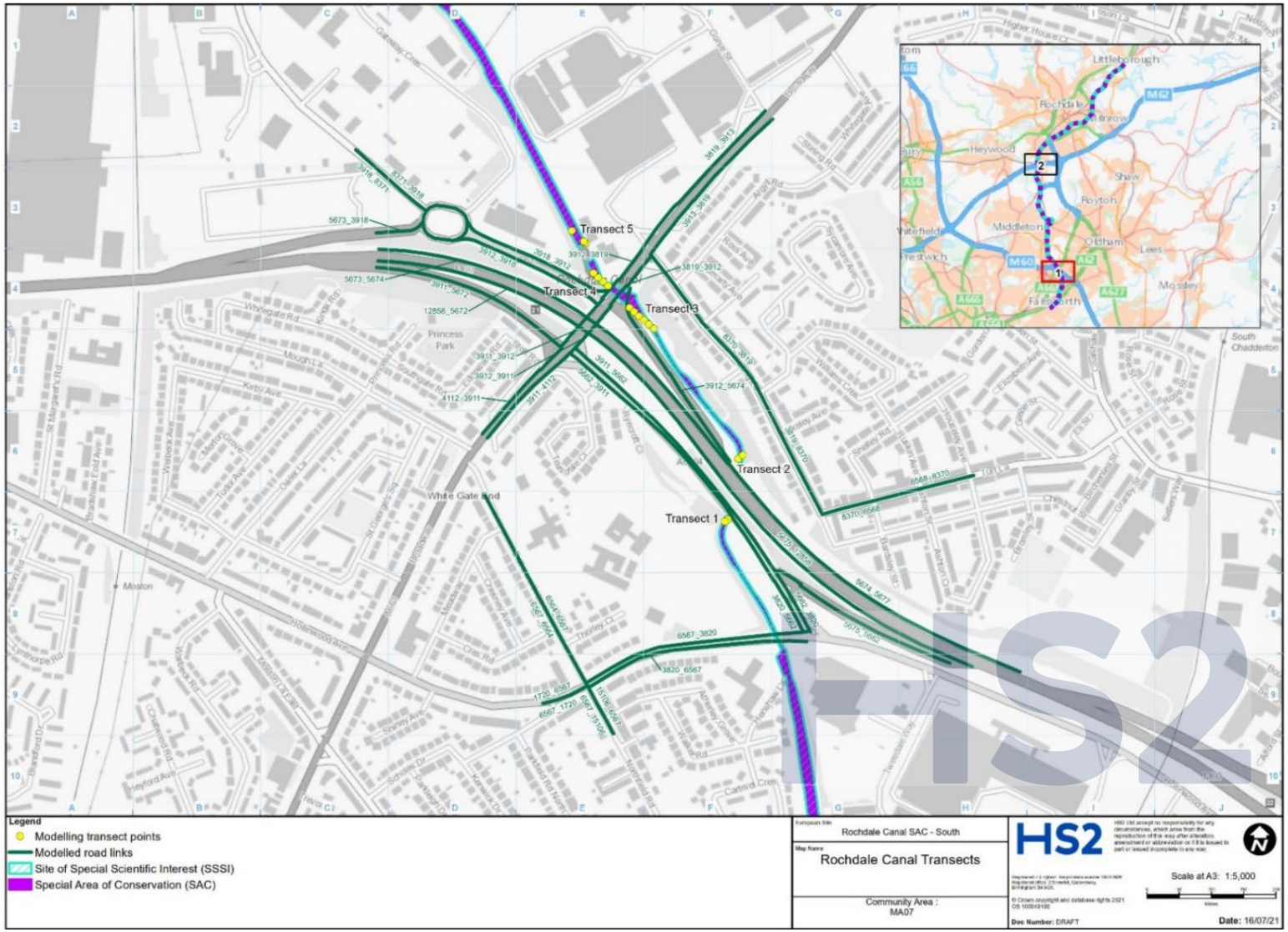


Figure A2: A map of Rochdale Canal Transects 6 to 7, including modelled links and modelled ecological receptor points

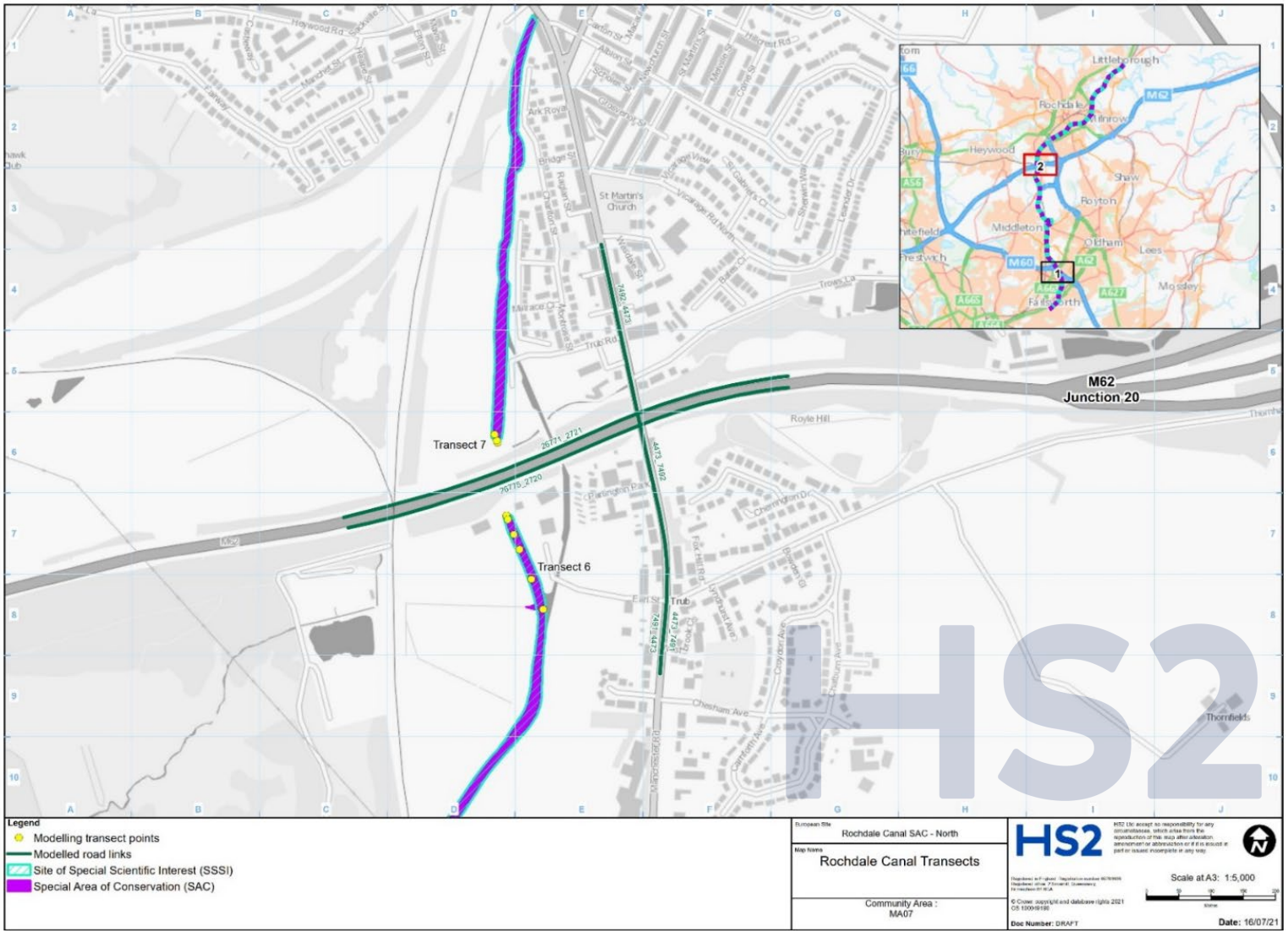


Table A3: Modelled ecological receptor backgrounds, APIS data and critical loads (construction phase)

Receptor	Sensitive habitat*	2018 NO_x background concentration ($\mu g/m^3$)	2025 NO_x background concentration ($\mu g/m^3$)	APIS data[25] of average total nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr) **
Rochdale Canal Transect 1	Fen, Marsh and Swamp	28.9	20.7	30.0	3
Rochdale Canal Transect 2	Fen, Marsh and Swamp	28.9	20.7	30.0	3
Rochdale Canal Transect 3	Fen, Marsh and Swamp	28.9	20.7	30.0	3
Rochdale Canal Transect 4	Fen, Marsh and Swamp	28.9	20.7	30.0	3
Rochdale Canal Transect 5	Fen, Marsh and Swamp	28.9	20.7	30.0	3
Rochdale Canal Transect 6	Fen, Marsh and Swamp	23.7	16.2	23.4	3
Rochdale Canal Transect 7	Fen, Marsh and Swamp	23.7	16.2	23.4	3

* *APIS classification appropriate for Standing Open Water and Canals.*

** *3 kg/N/ha/yr is applicable to Luronium natans.*

5.3 Assessment results

Table A4 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard ($30\mu g/m^3$).

Table A5 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A4: Predicted annual mean of NO_x concentrations at ecological sites (construction phase, Proposed Scheme alone)

Ecological site	Distance to nearest road (m)	2018 baseline NO_X concentrations ($\mu g/m^3$)	NO_x concentrations ($\mu g/m^3$)		Change in NO_x concentrations ($\mu g/m^3$)	Comparison against air quality standard ($30\mu g/m^3$)
			2025 without the Proposed Scheme	2025 with the Proposed Scheme		
Rochdale Canal SSSI and SAC Transect 1	4	58.80	35.47	35.59	0.12	Above standard
	10	52.43	32.38	32.49	0.11	Above standard
Rochdale Canal SSSI and SAC Transect 2	10	98.21	56.53	57.14	0.61	Above standard
	20	78.79	46.35	46.76	0.41	Above standard
Rochdale Canal SSSI and SAC Transect 3	0	106.82	60.41	61.20	0.79	Above standard
	10	84.57	48.95	49.46	0.51	Above standard
	20	77.44	45.34	45.77	0.43	Above standard
	30	73.31	43.26	43.65	0.39	Above standard
	40	70.39	41.79	42.15	0.36	Above standard
	50	68.10	40.64	40.97	0.33	Above standard
Rochdale Canal SSSI and SAC Transect 4	0	128.02	67.93	69.45	1.52	Above standard
	10	93.29	51.82	52.60	0.78	Above standard
	20	80.94	46.04	46.60	0.56	Above standard
	30	74.09	42.81	43.27	0.46	Above standard
Rochdale Canal SSSI and SAC Transect 5	71	54.20	33.22	33.43	0.21	Above standard
	75	53.52	32.89	33.09	0.20	Above standard
	100	50.33	31.34	31.51	0.17	Above standard
Rochdale Canal SSSI and SAC Transect 6	43	43.22	26.73	26.82	0.09	Within standard
	50	41.06	25.55	25.63	0.08	Within standard
	75	35.50	22.51	22.56	0.05	Within standard
	100	32.39	20.82	20.86	0.04	Within standard
	150	29.10	19.04	19.06	0.02	Within standard

Ecological site	Distance to nearest road (m)	2018 baseline NO_X concentrations ($\mu g/m^3$)	NO_x concentrations ($\mu g/m^3$)		Change in NO_x concentrations ($\mu g/m^3$)	Comparison against air quality standard ($30\mu g/m^3$)
			2025 without the Proposed Scheme	2025 with the Proposed Scheme		
	200	27.45	18.14	18.16	0.02	Within standard
Rochdale Canal SSSI and SAC Transect 7	36	69.29	41.01	41.17	0.16	Above standard
	40	66.05	39.23	39.39	0.16	Above standard
	50	59.38	35.59	35.72	0.13	Above standard

Table A5: Assessment of nitrogen deposition at ecological sites (construction phase, Proposed Scheme alone)

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2025 without the Proposed Scheme	2025 with the Proposed Scheme			
Rochdale Canal SSSI and SAC Transect 1	4	32.11	31.07	31.08	<0.01	3	0.3%
	10	31.67	30.84	30.85	<0.01	3	0.3%
Rochdale Canal SSSI and SAC Transect 2	10	34.55	32.53	32.57	0.04	3	1.3%
	20	33.4	31.84	31.87	0.03	3	1.0%
Rochdale Canal SSSI and SAC Transect 3	0	35.04	32.79	32.84	0.05	3	1.7%
	10	33.75	32.02	32.06	0.03	3	1.2%
	20	33.31	31.77	31.80	0.03	3	1.0%
	30	33.05	31.63	31.65	0.03	3	0.9%
	40	32.87	31.52	31.55	0.02	3	0.8%
	50	32.72	31.44	31.46	0.02	3	0.8%
Rochdale Canal SSSI and SAC Transect 4	0	36.18	33.27	33.36	0.09	3	3.2%
	10	34.27	32.22	32.27	0.05	3	1.7%
	20	33.53	31.82	31.86	0.04	3	1.3%

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2025 without the Proposed Scheme	2025 with the Proposed Scheme			
	30	33.1	31.60	31.63	0.03	3	1.1%
Rochdale Canal SSSI and SAC Transect 5	71	31.8	30.91	30.92	0.02	3	0.5%
	75	31.75	30.88	30.90	0.02	3	0.5%
	100	31.53	30.77	30.78	0.01	3	0.4%
Rochdale Canal SSSI and SAC Transect 6	43	24.83	24.19	24.20	<0.01	3	0.2%
	50	24.68	24.11	24.11	<0.01	3	0.2%
	75	24.27	23.87	23.88	<0.01	3	0.1%
	100	24.04	23.74	23.75	<0.01	3	<0.1%
	150	23.79	23.61	23.61	<0.01	3	<0.1%
	200	23.67	23.54	23.54	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 7	36	26.59	25.23	25.24	0.01	3	0.4%
	40	26.38	25.11	25.12	0.01	3	0.4%
	50	25.94	24.85	24.85	<0.01	3	0.3%

5.4 Assessment of significance (construction phase, Proposed Scheme alone)

NO_x concentrations are predicted to be above the air quality standard at all modelled receptors in the baseline and future scenarios with the exception of Transect 6. In Transect 6 concentrations are below the standard beyond 150m from the road in 2018 and at all locations in 2025 (with or without the Proposed Scheme). The Proposed Scheme is not predicted to cause an exceedance of the air quality standard in any modelled locations.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. The changes in nitrogen deposition due to the Proposed Scheme are predicted to be above 1% of the relevant critical load in Transects 2, 3 and 4 (up to approximately 40m from the nearest road). Potentially significant effects are therefore predicted within these areas, and this is addressed further in Section 3.4 of the main HRA report.

6 Assessment of construction traffic effects – Proposed Scheme in combination with other plans and projects

6.1 Screening of traffic data

The assessment of construction traffic impacts has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2025-2037). Traffic data is presented in Table A2.

The in-combination assessment uses the same transects as the 'scheme alone' assessment except where a reduction in NO_x or nitrogen deposition is predicted due to the scheme alone. There are a small number of other discrete roads within 200m of the SAC where the screening criteria are triggered in combination with other plans and projects. However, the same transects have been used as they provide sufficient modelling information upon which to draw conclusions on the potential for impacts on the SAC. A summary of the traffic used for the construction assessment is presented within Table A2.

Figure A1 and Figure A2 present maps of the sites, assessed roads and modelled receptors.

6.2 Non-road plans and projects

The Chadderton Energy Reserve Facility, off Broadgate, Oldham has been identified approximately 250m south west of the Rochdale Canal SAC, close to M60 J21. It received an Environmental Permit in January 2020 which includes for the operation of four 10MWth input engines and one 6MWth engine. The process contribution from these combustion plant to nitrogen deposition have been accounted for within the assessment. This has been achieved by adding the process contribution, as reported in the permit application documents, to Transects 3 to 5[44].

[44] Clarke Energy Ltd (2019), *Air Quality Assessment Chadderton Generation Facility*, Broadgate, Oldham.

6.3 Receptors assessed and background concentrations

Figure A1 and Figure A2 present a detailed map of the modelled area including assessed roads (road network in blue, haul roads in green) and modelled receptors (yellow dots).

Table A6 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads.

Table A6: Modelled ecological receptor backgrounds, APIS data and critical loads (construction phase, Proposed Scheme in-combination)

Receptor	Sensitive habitat	2018 NO_x background concentration ($\mu g/m^3$)	2025 NO_x background concentration ($\mu g/m^3$)	APIS data[25] of average total nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)
Rochdale Canal Transect 1	Fen, Marsh and Swamp (A)	28.9	20.7	30.0	3
Rochdale Canal Transect 2	Fen, Marsh and Swamp (A)	28.9	20.7	30.0	3
Rochdale Canal Transect 3	Fen, Marsh and Swamp (A)	28.9	20.7	30.0	3
Rochdale Canal Transect 4	Fen, Marsh and Swamp (A)	28.9	20.7	30.0	3
Rochdale Canal Transect 5	Fen, Marsh and Swamp (A)	28.9	20.7	30.0	3
Rochdale Canal Transect 6	Fen, Marsh and Swamp (B)	23.7	16.2	23.4	3
Rochdale Canal Transect 7	Fen, Marsh and Swamp (B)	23.7	16.2	23.4	3

6.4 Assessment results

Table A7 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard ($30\mu g/m^3$).

Table A8 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A7: Predicted annual mean of NO_x concentrations at ecological sites (construction phase, Proposed Scheme in-combination)

Ecological site	Distance to nearest road (m)	2018 baseline NO_x concentrations (µg/m³)	NO_x concentrations (µg/m³)		Change in NO_x concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)
			2025 do nothing	2025 with the Proposed Scheme in combination		
Rochdale Canal SSSI and SAC Transect 1	4	58.80	34.61	38.79	4.18	Above standard
	10	52.43	31.65	35.69	4.04	Above standard
Rochdale Canal SSSI and SAC Transect 2	10	98.21	53.80	60.34	6.54	Above standard
	20	78.79	44.41	49.96	5.55	Above standard
Rochdale Canal SSSI and SAC Transect 3	0	106.82	58.01	64.40	6.39	Above standard
	10	84.57	47.21	52.66	5.45	Above standard
	20	77.44	43.78	48.97	5.19	Above standard
	30	73.31	41.80	46.85	5.05	Above standard
	40	70.39	40.39	45.35	4.96	Above standard
	50	68.10	39.29	44.17	4.88	Above standard
Rochdale Canal SSSI and SAC Transect 4	0	128.02	67.47	72.65	5.18	Above standard
	10	93.29	51.01	55.80	4.79	Above standard
	20	80.94	45.17	49.80	4.63	Above standard
	30	74.09	41.95	46.47	4.52	Above standard
Rochdale Canal SSSI and SAC Transect 5	71	54.20	32.63	36.63	4.00	Above standard
	75	53.52	32.30	36.29	3.99	Above standard
	100	50.33	30.79	34.71	3.92	Above standard
Rochdale Canal SSSI and SAC Transect 6	43	43.22	24.76	26.82	2.06	Within standard
	50	41.06	23.81	25.63	1.82	Within standard
	75	35.50	21.35	22.56	1.21	Within standard
	100	32.39	19.98	20.86	0.88	Within standard

Ecological site	Distance to nearest road (m)	2018 baseline NO_x concentrations (µg/m³)	NO_x concentrations (µg/m³)		Change in NO_x concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)
			2025 do nothing	2025 with the Proposed Scheme in combination		
	150	29.10	18.54	19.06	0.52	Within standard
	200	27.45	17.81	18.16	0.35	Within standard
Rochdale Canal SSSI and SAC Transect 7	36	69.29	36.46	41.17	4.71	Above standard
	40	66.05	35.01	39.39	4.38	Above standard
	50	59.38	32.03	35.72	3.69	Above standard

Table A8: Assessment of nitrogen deposition at ecological sites (construction phase, Proposed Scheme in-combination)

Ecological site	Distance to nearest road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
		2018 baseline	2025 do nothing	2025 with the Proposed Scheme in combination			
Rochdale Canal SSSI and SAC Transect 1	4	32.11	31.01	31.08	0.07	3	2.4%
	10	31.67	30.79	30.85	0.06	3	2.1%
Rochdale Canal SSSI and SAC Transect 2	10	34.55	32.35	32.57	0.22	3	7.4%
	20	33.40	31.71	31.87	0.16	3	5.5%
Rochdale Canal SSSI and SAC Transect 3	0	35.04	32.63	32.94	0.31	3	10.2%
	10	33.75	31.90	32.15	0.25	3	8.4%
	20	33.31	31.66	31.90	0.24	3	7.9%
	30	33.05	31.52	31.75	0.23	3	7.6%
	40	32.87	31.42	31.65	0.23	3	7.4%
	50	32.72	31.35	31.56	0.21	3	7.2%
Rochdale Canal SSSI and SAC Transect 4	0	36.18	33.24	33.46	0.22	3	7.4%
	10	34.27	32.16	32.37	0.21	3	6.8%

Ecological site	Distance to nearest road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
		2018 baseline	2025 do nothing	2025 with the Proposed Scheme in combination			
	20	33.53	31.76	31.96	0.20	3	6.6%
	30	33.10	31.54	31.73	0.19	3	6.3%
Rochdale Canal SSSI and SAC Transect 5	71	31.80	30.86	31.02	0.16	3	5.2%
	75	31.75	30.84	30.99	0.15	3	5.2%
	100	31.53	30.73	30.88	0.15	3	5.0%
Rochdale Canal SSSI and SAC Transect 6	43	24.83	24.04	24.20	0.16	3	5.2%
	50	24.68	23.97	24.11	0.14	3	4.6%
	75	24.27	23.78	23.88	0.10	3	3.1%
	100	24.04	23.68	23.75	0.07	3	2.3%
	150	23.79	23.57	23.61	0.04	3	1.3%
	200	23.67	23.51	23.54	0.03	3	0.9%
Rochdale Canal SSSI and SAC Transect 7	36	26.59	24.91	25.24	0.33	3	11.2%
	40	26.38	24.80	25.12	0.32	3	10.5%
	50	25.94	24.59	24.85	0.26	3	8.9%

6.5 Assessment of significance (construction phase, Proposed Scheme in-combination)

NO_x concentrations are predicted to be above the air quality standard at all modelled receptors in the baseline and future scenarios with the exception of Transect 6. In Transect 6 concentrations are below the standard beyond 150m from the road in 2018, and at all locations in 2025 (with or without the Proposed Scheme). The Proposed Scheme in combination with other plans and projects is not predicted to cause an exceedance of the air quality standard in any modelled locations.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios. Predicted nitrogen deposition rates in 2025, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition due to the Proposed Scheme in combination with other plans and projects are predicted to be above 1% of the relevant critical load in all Transects. Potentially significant effects are therefore predicted within these areas, and this is addressed further in Section 3.5 of the main HRA report.

7 Assessment of operational traffic effects - Proposed Scheme alone

7.1 Screening of traffic data

The assessment of operational traffic impacts has used traffic data based on an estimate of the average daily flows in the opening year of operation (2038). Traffic data are presented in Table A9 and Table A10. The screening process identified one road in the area exceeding the screening thresholds: the A663 Broadway. However, the assessment uses the same transects as the construction 'scheme alone' assessment.

Table A9: Traffic data summary (operational phase)

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
3912_3819, 3819_3912	A663 Broadway, north of M60 junction 21	46,173	46,706	44,736	**-1,969**	**-1,436**	1,794	2,136	2,117	-20	**323**
3913_3819, 3819_3913	A663 Broadway, north of M60 junction 21	41,163	41,610	39,641	**-1,970**	**-1,523**	1,580	1,913	1,893	-19	**314**
3918_3912, 3912_3918	A663 Broadway over M60 junction 21	9,453	10,601	9,999	-603	546	463	555	556	2	94
7492_4473, 4473_7492	A664 Manchester Road	18,412	20,164	20,150	-14	**1,738**	408	412	411	-1	3
7491_4473, 4473_7491	A664 Manchester Road	18,412	20,164	20,150	-14	**1,738**	408	412	411	-1	3
6567_6564, 6564_6567	Butterworth Lane	545	567	570	3	25	8	5	5	-0	-4
8370_6568, 6568_8370	Turf Lane	167	161	165	4	-2	161	158	158	-0	-3

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
8370_3819, 3819_8370	Long Lane	5,036	5,137	5,135	-2	99	240	261	261	-0	21
5662_3820, 3820_5662	A6104 Semple Way, Oldham	17,948	18,211	18,226	15	278	318	287	289	2	-29
6567_3820, 3820_6567	A6104 Hollinwood Avenue	15,506	18,142	18,264	122	**2,757**	262	337	336	-1	74
3911_3912, 3912_3911	A663 Broadway over M60 junction 21	37,652	38,772	38,236	-536	583	1,353	1,520	1,512	-7	160
5662_3911, 3911_5662	A6104 Semple Way, Oldham	11,271	11,541	11,540	-1	269	494	595	595	0	101
4112_3911, 3911_4112	A663 Broadway, south of M60 junction 21	40,660	42,244	41,765	-479	**1,105**	1,003	1,072	1,070	-3	67
5675_5662	M60 junction 21 northbound offslip	17,342	17,651	17,580	-71	238	305	321	322	0	17

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
3911_5672	M60 junction 21 northbound onslip	18,606	18,557	18,637	79	31	502	579	583	4	81
12858_5672	M60 beneath junction 21	27,474	32,249	32,347	98	**4,873**	1,819	2,055	2,055	0	**236**
3912_5674	M60 junction 21 southbound onslip	14,133	15,335	15,461	126	**1,328**	424	579	578	-1	154
5673_5674	M60 beneath junction 21	36,751	43,863	44,219	356	**7,468**	1,812	2,236	2,240	4	**428**
5674_5677	M60 junction 21 to 22	50,885	59,198	59,680	482	**8,795**	2,235	2,815	2,818	3	**583**
5675_12858	M60 junction 21 to 22	27,474	32,249	32,347	98	**4,873**	1,819	2,055	2,055	0	**236**
5673_3918	M60 junction 21 southbound offslip	7,162	8,229	8,165	-64	**1,003**	376	431	426	-5	50
8371_3918, 3918_8371	B6189 Broadgate	4,606	6,771	8,217	1,446	**3,611**	208	267	273	6	65

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
15106_6567, 6567_15106	Northfield Road	1,053	1,950	1,797	-152	744	31	51	51	0	21
6567_1720, 1720_6567	A6104 Hollinwood Avenue	14,808	15,990	16,240	249	**1,432**	233	283	283	-1	50
2722_2720	M62 junction 19 to 20	60,784	80,432	80,378	-54	**19,594**	6,713	8,001	8,017	16	**1,304**
2719_2721	M62 junction 19 to 20	61,004	75,144	75,115	-29	**14,111**	6,873	7,587	7,580	-7	707

Note: Values in bold indicate change in traffic flow triggering for assessment.

Table A10: Traffic data summary (operational phase)

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
3912_3819, 3819_3912	A663 Broadway, north of M60 junction 21	46,173	46,706	44,736	**-1,969**	**-1,436**	1,794	2,136	2,117	-20	**323**
3913_3819, 3819_3913	A663 Broadway, north of M60 junction 21	41,163	41,610	39,641	**-1,970**	**-1,523**	1,580	1,913	1,893	-19	**314**
3918_3912, 3912_3918	A663 Broadway over M60 junction 21	9,453	10,601	9,999	-603	546	463	555	556	2	94
7492_4473, 4473_7492	A664 Manchester Road	18,412	20,164	20,150	-14	**1,738**	408	412	411	-1	3
7491_4473, 4473_7491	A664 Manchester Road	18,412	20,164	20,150	-14	**1,738**	408	412	411	-1	3
6567_6564, 6564_6567	Butterworth Lane	545	567	570	3	25	8	5	5	-0	-4

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
8370_6568, 6568_8370	Turf Lane	167	161	165	4	-2	161	158	158	-0	-3
8370_3819, 3819_8370	Long Lane	5,036	5,137	5,135	-2	99	240	261	261	-0	21
5662_3820, 3820_5662	A6104 Semple Way, Oldham	17,948	18,211	18,226	15	278	318	287	289	2	-29
6567_3820, 3820_6567	A6104 Hollinwood Avenue	15,506	18,142	18,264	122	**2,757**	262	337	336	-1	74
3911_3912, 3912_3911	A663 Broadway over M60 junction 21	37,652	38,772	38,236	-536	583	1,353	1,520	1,512	-7	160
5662_3911, 3911_5662	A6104 Semple Way, Oldham	11,271	11,541	11,540	-1	269	494	595	595	0	101
4112_3911, 3911_4112	A663 Broadway, south of M60 junction 21	40,660	42,244	41,765	-479	**1,105**	1,003	1,072	1,070	-3	67

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
5675_5662	M60 junction 21 northbound offslip	17,342	17,651	17,580	-71	238	305	321	322	0	17
3911_5672	M60 junction 21 northbound onslip	18,606	18,557	18,637	79	31	502	579	583	4	81
12858_5672	M60 beneath junction 21	27,474	32,249	32,347	98	**4,873**	1,819	2,055	2,055	0	**236**
3912_5674	M60 junction 21 southbound onslip	14,133	15,335	15,461	126	**1,328**	424	579	578	-1	154
5673_5674	M60 beneath junction 21	36,751	43,863	44,219	356	**7,468**	1,812	2,236	2,240	4	**428**
5674_5677	M60 junction 21 to 22	50,885	59,198	59,680	482	**8,795**	2,235	2,815	2,818	3	**583**
5675_12858	M60 junction 21 to 22	27,474	32,249	32,347	98	**4,873**	1,819	2,055	2,055	0	**236**

Road ID	Road name	Annual Average Daily Traffic (AADT)					Heavy Duty Vehicles (HDV)				
		2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)	2018 baseline	2038 without the Proposed Scheme	2038 with the Proposed Scheme	Proposed Scheme alone change (2038 with Proposed Scheme – 2038 without Proposed Scheme)	In-combination change (2038 with the Proposed Scheme – 2018 baseline)
5673_3918	M60 junction 21 southbound offslip	7,162	8,229	8,165	-64	**1,003**	376	431	426	-5	50
8371_3918, 3918_8371	B6189 Broadgate	4,606	6,771	8,217	1,446	**3,611**	208	267	273	6	65
15106_6567, 6567_15106	Northfield Road	1,053	1,950	1,797	-152	744	31	51	51	0	21
6567_1720, 1720_6567	A6104 Hollinwood Avenue	14,808	15,990	16,240	249	**1,432**	233	283	283	-1	50
2722_2720	M62 junction 19 to 20	60,784	80,432	80,378	-54	**19,594**	6,713	8,001	8,017	16	**1,304**
2719_2721	M62 junction 19 to 20	61,004	75,144	75,115	-29	**14,111**	6,873	7,587	7,580	-7	707

Note: Values in bold indicate change in traffic flow triggering for assessment.

7.2 Receptors assessed and background concentrations

Figure A1 and Figure A2 present a detailed map of the modelled area including assessed roads (road network in blue, haul roads in green) and modelled receptors (yellow dots).

Table A11 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads.

Table A11: Modelled ecological receptor backgrounds, APIS data and critical loads (operation phase, Proposed Scheme alone)

Receptor	Sensitive habitat	2018 NO_x background concentration (µg/m^3)	2038 NO_x background concentration (µg/m^3)	APIS data[25] of average total nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)
Rochdale Canal Transect 1	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3
Rochdale Canal Transect 2	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3
Rochdale Canal Transect 3	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3
Rochdale Canal Transect 4	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3
Rochdale Canal Transect 5	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3
Rochdale Canal Transect 6	Fen, Marsh and Swamp (B)	23.7	14.0	23.4	3
Rochdale Canal Transect 7	Fen, Marsh and Swamp (B)	23.7	14.0	23.4	3

7.3 Assessment results

Table A12 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m^3).

Table A13 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A12: Predicted annual mean of NO_x concentrations at ecological sites (operational phase, Proposed Scheme alone)

Ecological site	Distance to nearest road (m)	2018 baseline NO_x concentrations ($\mu g/m^3$)	NO_x concentrations ($\mu g/m^3$)		Change in NO_x concentrations ($\mu g/m^3$)	Comparison against air quality standard ($30\mu g/m^3$)
			2038 without the Proposed Scheme	2038 with the Proposed Scheme		
Rochdale Canal SSSI and SAC Transect 1	4	58.80	24.33	24.34	0.01	Within standard
	10	52.43	23.03	23.05	0.02	Within standard
Rochdale Canal SSSI and SAC Transect 2	10	98.21	32.50	32.59	0.09	Above standard
	20	78.79	28.47	28.53	0.06	Within standard
Rochdale Canal SSSI and SAC Transect 3	0	106.82	34.67	34.70	0.03	Above standard
	10	84.57	29.92	29.93	0.01	Within standard
	20	77.44	28.40	28.41	0.01	Within standard
	30	73.31	27.52	27.54	0.02	Within standard
	40	70.39	26.89	26.92	0.03	Within standard
	50	68.10	26.41	26.43	0.02	Within standard
Rochdale Canal SSSI and SAC Transect 4*	0	128.02	39.63	38.62	<0.01	Above standard
	10	93.29	32.07	31.63	<0.01	Above standard
	20	80.94	29.40	29.11	<0.01	Within standard
	30	74.09	27.92	27.70	<0.01	Within standard
Rochdale Canal SSSI and SAC Transect 5*	71	54.20	23.64	23.56	<0.01	Within standard
	75	53.52	23.49	23.42	<0.01	Within standard
	100	50.33	22.81	22.75	<0.01	Within standard
Rochdale Canal SSSI and SAC Transect 6*	43	43.22	18.14	18.14	<0.01	Within standard
	50	41.06	17.67	17.67	<0.01	Within standard
	75	35.50	16.47	16.47	<0.01	Within standard
	100	32.39	15.80	15.80	<0.01	Within standard
	150	29.10	15.10	15.10	<0.01	Within standard

Ecological site	Distance to nearest road (m)	2018 baseline NO_x concentrations (µg/m^3)	NO_x concentrations (µg/m^3)		Change in NO_x concentrations (µg/m^3)	Comparison against air quality standard (30µg/m^3)
			2038 without the Proposed Scheme	2038 with the Proposed Scheme		
	200	27.45	14.75	14.75	<0.01	Within standard
Rochdale Canal SSSI and SAC Transect 7*	36	69.29	23.79	23.78	<0.01	Within standard
	40	66.05	23.08	23.08	<0.01	Within standard
	50	59.38	21.65	21.64	<0.01	Within standard

*Notes: * indicates that points in this transect cause a reduction in concentrations as a result of the Proposed Scheme – alone and therefore is not considered within the Proposed Scheme – in-combination assessment*

Table A13: Assessment of nitrogen deposition at ecological sites (operational phase, Proposed Scheme alone)

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2038 without the Proposed Scheme	2038 with the Proposed Scheme			
Rochdale Canal SSSI and SAC Transect 1	4	32.11	30.41	30.42	<0.01	3	<0.1%
	10	31.67	30.32	30.32	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 2	10	34.55	31.01	31.02	<0.01	3	0.2%
	20	33.40	30.72	30.73	<0.01	3	0.1%
Rochdale Canal SSSI and SAC Transect 3	0	35.04	31.17	31.17	<0.01	3	<0.1%
	10	33.75	30.83	30.83	<0.01	3	<0.1%
	20	33.31	30.72	30.72	<0.01	3	<0.1%
	30	33.05	30.65	30.65	<0.01	3	<0.1%
	40	32.87	30.61	30.61	<0.01	3	<0.1%
	50	32.72	30.57	30.57	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 4 *	0	36.18	31.52	31.45	<0.01	3	<0.1%
	10	34.27	30.98	30.95	<0.01	3	<0.1%

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2038 without the Proposed Scheme	2038 with the Proposed Scheme			
	20	33.53	30.79	30.77	<0.01	3	<0.1%
	30	33.10	30.68	30.66	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 5 *	71	31.80	30.36	30.36	<0.01	3	<0.1%
	75	31.75	30.35	30.35	<0.01	3	<0.1%
	100	31.53	30.30	30.30	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 6 *	43	24.83	23.70	23.70	<0.01	3	<0.1%
	50	24.68	23.67	23.67	<0.01	3	<0.1%
	75	24.27	23.58	23.57	<0.01	3	<0.1%
	100	24.04	23.52	23.52	<0.01	3	<0.1%
	150	23.79	23.47	23.47	<0.01	3	<0.1%
	200	23.67	23.44	23.44	<0.01	3	<0.1%
Rochdale Canal SSSI and SAC Transect 7 *	36	26.59	24.13	24.13	<0.01	3	<0.1%
	40	26.38	24.08	24.07	<0.01	3	<0.1%
	50	25.94	23.97	23.97	<0.01	3	<0.1%

*Notes: * indicates that points in this transect cause a reduction in deposition as a result of the Proposed Scheme – alone and therefore is not considered within the Proposed Scheme – in-combination assessment.*

7.4 Assessment of significance (operational phase, Proposed Scheme alone)

In the 2018 Baseline scenario NO_x concentrations are above the air quality standard at all modelled locations except beyond 150m from the nearest road in Transect 6. By 2038 concentrations are only above the standard within approximately 10m of the nearest roads in Transects 2, 3 and 4.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. The changes in nitrogen deposition due to the Proposed Scheme are predicted to be below 1% of the relevant critical load in all locations and therefore no potentially significant effects are predicted.

8 Assessment of operational traffic effects - Proposed Scheme in combination with other plans and projects

8.1 Screening of traffic data

The assessment of operational traffic impacts has used traffic data based on an estimate of the average daily flows in the opening year of operation (2038). Traffic data are presented in Table A9 and Table A10.

The screening process identified four roads in the area exceeding the screening thresholds. The in-combination assessment uses the same transects as the operation 'Proposed Scheme alone' assessment, except where the Proposed Scheme reduces nitrogen deposition. Transects 4 to 7 are therefore not considered for the in-combination assessment.

8.2 Non-road plans and projects

The Chadderton Energy Reserve Facility, off Broadgate, Oldham has been identified approximately 250m south-west of the Rochdale Canal SAC, close to M60 junction 21. It received an Environmental Permit in January 2020 which includes for the operation of four 10MWth input engines and one 6MWth engine. The process contribution from these combustion plant to nitrogen deposition have been accounted for within the assessment. This has been achieved by adding the process contribution, as reported in the permit application documents to Transect 3[44].

8.3 Receptors assessed and background concentrations

Figure A1 and Figure A2 present maps of the sites, assessed roads and modelled receptors.

Table A14 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads.

Table A14: Modelled ecological receptor backgrounds, APIS data and critical loads (operation phase, Proposed Scheme in-combination)

Receptor	Sensitive habitat	2018 NO_x background concentration ($\mu g/m^3$)	2038 NO_x background concentration ($\mu g/m^3$)	APIS data [25] of average total nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)
Rochdale Canal Transect 1	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3
Rochdale Canal Transect 2	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3
Rochdale Canal Transect 3	Fen, Marsh and Swamp (A)	28.9	18.3	30.0	3

8.4 Assessment results

Table A15 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard ($30\mu g/m^3$).

Table A16 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A15: Predicted annual mean of NO_x concentrations at ecological sites (operational phase, Proposed Scheme in-combination)

Ecological Site	Distance to nearest road (m)	2018 baseline NO_x concentrations ($\mu g/m^3$)	NO_x concentrations ($\mu g/m^3$)		Change in NO_x concentrations ($\mu g/m^3$)	Comparison against air quality standard ($30\mu g/m^3$)
			2038 do nothing	2038 with the Proposed Scheme in combination		
Rochdale Canal SSSI and SAC Transect 1	4	58.80	23.74	27.54	3.80	Within standard
	10	52.43	22.54	26.25	3.71	Within standard
Rochdale Canal SSSI and SAC Transect 2	10	98.21	30.67	35.79	5.12	Above standard
	20	78.79	27.18	31.73	4.55	Above standard
Rochdale Canal SSSI and SAC Transect 3	0	106.82	33.28	37.90	4.62	Above standard
	10	84.57	28.87	33.13	4.26	Above standard
	20	77.44	27.45	31.61	4.16	Above standard
	30	73.31	26.63	30.74	4.11	Above standard
	40	70.39	26.04	30.12	4.08	Above standard
	50	68.10	25.59	29.63	4.04	Within standard

Table A16: Assessment of nitrogen deposition at ecological sites (operational phase, Proposed Scheme in-combination)

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2038 do nothing	2038 with the Proposed Scheme in combination			
Rochdale Canal SSSI and SAC Transect 1	4	32.11	30.37	30.42	0.05	3	1.5%
	10	31.67	30.28	30.32	0.04	3	1.3%
Rochdale Canal SSSI and SAC Transect 2	10	34.55	30.88	31.02	0.14	3	4.6%
	20	33.40	30.63	30.73	0.10	3	3.3%
Rochdale Canal SSSI and SAC Transect 3	0	35.04	31.07	31.27	0.20	3	6.6%
	10	33.75	30.75	30.93	0.18	3	5.8%

Ecological site	Distance to nearest road (m)	2018 baseline dry deposition (kg N/ha/yr)	Dry deposition (kg N/ha/yr)		Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
			2038 do nothing	2038 with the Proposed Scheme in combination			
	20	33.31	30.65	30.81	0.16	3	5.6%
	30	33.05	30.59	30.75	0.16	3	5.5%
	40	32.87	30.54	30.71	0.17	3	5.4%
	50	32.72	30.51	30.67	0.16	3	5.3%

8.5 Assessment of significance (operational phase, Proposed Scheme in-combination)

In the 2018 Baseline scenario NO_x concentrations are above the air quality standard at all modelled locations except beyond 150m from the nearest road in Transect 6. By 2038 concentrations are above the standard within approximately 10m of the nearest roads in Transects 2 and 3 and potentially significant increases in NO_x are predicted as a result of the Proposed Scheme in combination with other plans and projects at these locations.

Nitrogen deposition rates are predicted to be above the relevant critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. Predicted nitrogen deposition rates in 2038, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition due to the Proposed Scheme in combination with other plans and projects are predicted to be above 1% of the relevant critical load at a number of locations in all Transects. Potentially significant effects are therefore predicted within these areas, and this is addressed further in Section 3.7 of the main HRA report.

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