The Norfolk County Council (Norwich Northern Distributor Road (A1067 to A47(T))) Order

Habitat Regulations Assessment Addendum

Planning Act 2008

Infrastructure Planning

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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1. Introduction

This report is an addendum to the Environmental Statement, Volume 2, Chapter 17 Habitats Regulations Assessment (HRA) (Document Reference 6.2) that supports the Development Consent Order (DCO) application for the Norfolk County Council (Norwich Northern Distributor Road (A1067 to A47(T))) Order (PINS reference No. TR010015). This addendum will make references to, and should be read in conjunction with this report, hereafter referred to as the 'DCO HRA'.

The Habitats Regulations Assessment considers the potential significant effects of the Norwich Northern Distributor Road (hereafter referred to as the "NDR") on the River Wensum Special Area of Conservation (SAC).

A draft HRA was submitted to Natural England and the Environment Agency prior to the DCO application submission. A meeting took place with Natural England and the Environment Agency on 15th January 2014 to discuss further how the HRA should be improved to adequately assess all the potential significant effects of the NDR on the River Wensum SAC; in particular, a more detailed assessment of the impact of sediment ingress as a result of increase traffic volumes along roads crossing the River Wensum once the NDR is operational.

This Addendum report sets out and addresses the concerns of Natural England and the Environment Agency provided in Appendix A, references the DCO HRA report where appropriate and presents further mitigation should significant effects be identified. This Addendum was first provided to Natural England and the Environment Agency for review in May 2014, as Revision A and issued again in July 2014 as Revision B. This revision (Revision C) addresses the comments subsequently received from both Revision A and B.

Report section references differ between the draft HRA and the DCO HRA, although the contents of both reports remain the same. Report references will largely focus on those in the DCO HRA but in some cases to the draft HRA where appropriate.

2. Addendum considerations

2.1 Consultation responses to the draft HRA

Following a review of the draft HRA, comments received from Natural England and the Environment Agency have been considered within this addendum. Comments were provided at a meeting on 15th January 2014, and in their formal letter responses dated 23rd January 2014 from the Environment Agency and 5th March 2014 from Natural England. Meeting minutes and letters are presented in Appendix A.

A summary of key comments is provided in Table 2.1 and reference made to section/s in this report where these have been addressed.

Table 2.1: Environment Agency and Natural England consultation responses to draft HRA

Consultation responses	Draft HRA report reference	DCO HRA report reference	Addendum report reference
General comments			
Provide more detailed explanations as to why potential impacts have been discounted, particularly sediment ingress (road and agricultural runoff).	-	-	All sections
Minor text alterations suggested within Natural England's letter dated 5th March 2014.	Various refs	Various refs	Section 2.2.1 Appendix E
Consider the impacts of associated construction activities e.g. site compounds, gas main diversion (chainage 1100m) where appropriate	Section 4.2.1.2	Paragraphs D.2.6 to D.2.12	Section 2.2.2
Review list of EA consents and include only those that are necessary for the Scheme, with details of the construction activities associated with them.	Section 2.1 Table 2.2	Section B.1 Table B.2	Section 2.2.3
The section on in-combination effects is too short and needs to explain in more detail why these impacts have been ruled out.	Section 4.3.2.2	Paragraph D.3.8	Section 2.2.4
Sediment ingress			
Further assessment required to consider and explain how silt ingress could potentially change due to changes in traffic volumes. Provide more explanation and interpretation of traffic modelling behind Table 4.2. To include further justification for conclusions e.g. adding overall/aggregate sediment loading across the SAC.	Table 4.2	Table D.2	Section 3
Consider indirect impacts of increased traffic and associated sedimentation along roads that cross/drain to the Wensum. Consider connecting roads with potential linked surface water drainage networks.	Section 2.4.2.2	Paragraphs B.4.12 to B.4.18	Section 3
Define and explain in more detail how the zone of influence was derived. Increase the zone of influence to include all roads crossing the River Wensum within the SAC boundary (up and downstream). Provide a map to show this.	Section 2.3.9	Section B.3.26 and B.3.27	Section 3.4 Drawing no. MMD-233906-DT-0995 (Appendix B)
Provide detailed methodology for the drive-along survey, including the qualification of surveyors, timing of survey and weather conditions. Another visit is necessary, preferably during wet weather conditions.	Section 4.2.2.5	Paragraphs D.2.34 to D.2.39	Section 3.6 Drawing no. MMD-233906-DT-0999-1011 (Appendix B)
Include details of proposed non-NDR road/drainage upgrade works by NCC along rat running routes. This should be presented as mitigation in the HRA (e.g.	Section 4.4	Section D.4	Section 3.8 and 3.9

Consultation responses	Draft HRA report reference	DCO HRA report reference	Addendum report reference
Ringland Hills) but noted these works support but do not form part of the DCO application.			
Consider ecological impacts if the assessment of sediment ingress suggests any changes to sedimentation.	Section 5.2	Section E.2	Section 6
Groundwater levels and protection			
Section called 'evidence to support conclusions' in Stage 1 outcomes and screening matrix contradicts explanatory text, therefore need to add more ticks in the matrix where necessary. Due to the hydraulic connectivity between surface water and groundwater in the River Wensum, changes in groundwater levels could affect the rooting zone of submerged and floating macrophytes, functionality of spawning by brook lamprey, bullhead and other fish species.	Section 2.4.2 Table3.1, Table 5.1 and Table 2.6	Section C.2 Table 3.1 (should be Table C.1)	Section 4.2 Table 4.2
Proposed drainage design between chainage 390m and 780m on the sourthern side of the NDR appears to be missing. Confirm whether surface water run-off is anticipated in this section.	Section 4.2.2.1	Paragraphs D.2.18 to D2.21	Section 4.1
Best practice for protecting groundwater is to provide a three stage treatment step in the road drainage design. The potential need to line the swales to protect groundwater further should be considered in environmentally sensitive areas, as a pollution prevention measure. A risk-based approach should be explained and justification given if lining is not proposed.	Section 4.2.2.3	Paragraphs D.2.24 to D.2.30	Accidental spillage risk has already been assessed as low (see paragraphs D2.31 to D2.33 and Figure G.2). Risk of routine runoff on groundwater is assessed further in Section 4.3
Using the HAWRAT tool is considered a conservative approach i.e. dilution and attenuation within the groundwater has not been considered.	Section 4.2.2.3	Paragraphs D.2.24 to D.2.30	This was undertaken to show a worst case scenario – see paragraph D.2.26. No further assessment required.
Flood risk			
Provide clarification on how temporary ditches will be constructed to accommodate surface water run-off from topsoil and hard surfaces during construction to prevent discharge of silt laden water to the River Wensum, including calculations to demonstrate capacity during summer/winter storms. Explain how this will be implemented i.e. through the CEMP. Also, how the ditches will prevent overtopping and flooding of the golf course.	Section 4.2.1.2	Paragraph D.2.6 to D.2.12	Section 5 Appendix D

2.2 Addressing general comments

2.2.1 Minor paragraph amendments

As requested by Natural England the following minor text amendments are proposed with reference to the DCO HRA, along with additional supporting information where applicable:

- Within Paragraph B.3.25, text starting "*This reiterates the advice from a meeting held on 12 April 2006, where Natural England, then known as English Nature, confirmed that an HRA would be required in respect of the River Wensum SAC but not for the Broad SAC/SPA/Ramsar (English Nature in Planning and Transportation Technical Group, 2007).*" should be replaced by "*This reiterates the advice from a meeting held on 12 April 2006, where English Nature, one of Natural England's predecessors, confirmed that an HRA would be required in respect of the River Wensum SAC but not for the Broad SAC/SPA/Ramsar (English Nature's letter to Norfolk County Council dated 22.02.06).*"

- In Paragraph B.4.7 of the DCO HRA the text states the SAC units are in unfavourable condition. This is based on Natural England's assessment.

- The surveys of the River Wensum SAC referred to in Paragraph B.4.8 were commissioned as part of the evidence base for the NDR DCO application.

- In Table B.18, the last sentence in the 'presence/absence' box against the Desmoulin's Whorl Snail should read as follows "*Riparian land management makes this stretch of river unsuitable*."

- The Natura 2000 and Ramsar information referred to in Paragraph B.4.1 was missing from the appendices and is now provided in Appendix E.

- Surface and groundwater quality monitoring programmes varied with time and frequency of sampling, therefore the differing dates presented in B.4.16 and B.4.24 are correct.

- The following should be read in conjunction with Paragraph B.4.37:

    - The Norwich Area Transportation Strategy (NATS) aims to provide high-quality alternatives to the car including public transport, cycling and walking and to reduce carbon emissions and the impact of transport on the environment and our communities. A number of improvements have already been implemented in the city centre and elsewhere throughout the wider NATS area. The current traffic volumes and patterns in and around the city centre are such that further improvements are not possible. One aim of the NDR is to allow displacement of traffic out of the city centre, thereby freeing up capacity and allowing further improvements to take place and allowing the further aims of NATS to be fulfilled. A second aim of the NDR is to relieve existing and future pressure associated with traffic using unsuitable routes, both suburban and rural, around the east and north of the city. Therefore the strategy also includes the NDR to provide an alternative route for traffic to and from the north of Norwich. For the purposes of this in combination assessment the NDR is excluded from the strategy.

    - The remaining plans include improvements to the city centre; improved provisions for cycling and walking; and Bus Rapid Transport (BRT) routes; and improvements to rail and bus services. The A1067 Fakenham Road which the NDR joins at its western end is identified in the strategy as a core bus route. A Task 1 HRA of the NATS concluded that the NDR and a now defunct option for a park and ride facility at Taverham were the only options to result in a likely significant effect on the River Wensum SAC. However increased bus traffic along the A1067 leading to increased bus traffic on road crossings over the River Wensum could result in a likely significant effect in combination with the NDR

through increased sediment ingress from highways run-off (see Sections 2.2.4.3 and 3.8.2).

- A sub-heading is required above Paragraph B.4.39 entitled "Summary and conclusion of likely significant effect".

- All references made to Appendices A or B should be changed to Appendix 1 and 2 respectively.

2.2.2 Associated construction activities

The DCO HRA assessment largely focused on the footprint of the project with a particular focus on the first 1750m of the NDR route (see Paragraph B.3.27), but with an extended geographical area to consider potential indirect and cumulative impacts. In relation to sediment ingress and water quality the zone of influence (ZoI) has been redefined for this assessment (see Section 3.4).

Within the ZoI associated construction activities have been identified within Section B.3 of the DCO HRA and considered within the assessment of likely significant effects, such as the positioning of site compounds and the High Pressure Gas Main (HPGM).

In addition to the utility works identified within Section B.3.20 of the DCO HRA a plan can now be provided showing the location of these works (Drawing ref. MMD-233906-DT-0723 in **Appendix F**). However, detailed plans and a programme for utility works within the first 1750m are not currently available. Any minor, shallow diversions of cables or raw water pipes are unlikely to give rise to any significant adverse effect on groundwater or surface water quality or flows (Drawing references: VM1, AW1, BT0.5, BT1, BT2 and AW2). Above ground works, such as relocating the pole mounted transformer and laying a short section of cable underground at chainage 770m (Drawing ref. E1) is also considered unlikely to cause significant adverse effects due to a lack of pathway between the site and the river or groundwater table.

2.2.3 Consents relevant to the HRA

Consents relevant to the HRA were presented in Table B.2 of the DCO HRA. This list has been reviewed in light of comments from the Environment Agency. A revised list of relevant consents, with further details on the construction activities requiring such consents, is provided in Table 2.2, in line with those proposed in the '*Details of other consents, licences and permits'* report (Document Ref 5.4) submitted under the DCO application.

Table 2.2: Consents relevant to the HRA (DCO HRA Table B.2)

Consent	Act	Competent Authority	Construction activity or reason for omission
~~Abstraction licence~~	~~Water Act 2003~~	~~Environment Agency~~	N/A - No abstraction will be required that exceeds $20m^3$ per day.
~~Dewatering licence~~	~~Water Act 2003~~	~~Environment Agency~~	N/A – Dewatering unlikely due to the depth of groundwater table, except potentially for the gas main works (depth of excavations currently unknown).

Consent	Act	Competent Authority	Construction activity or reason for omission
~~Discharge licence for water~~	~~Environmental Permitting Regulations (England and Wales) 2010~~	~~Environment Agency~~	N/A - Potentially only applicable during the bridge and piling works at Postwick
~~Discharge of substances to groundwater~~	~~Environmental Permitting Regulations (England and Wales) 2010~~	~~Environment Agency~~	N/A
~~Discharge trade effluent to sewage~~	~~Water Industry Act 1991~~	~~Anglian Water~~	N/A
~~Works in, under, over or within 9m of Main River, of works affecting the flow in an ordinary watercourse, and work affecting Main Drains in IDB district~~	~~Water Resources Act 1991~~	~~Environment Agency~~	N/A – no works on Main RIvers
	~~Land Drainage Act 1991~~	~~Norfolk Rivers IDB~~	N/A - Rackheath Springs area only which is outside ZoI
Waste management licence	Environmental Permitting Regulations (England and Wales) 2010	Environment Agency	Potentially required
~~Mineral extraction~~	~~Town and Country Planning Act 1990~~	~~Norfolk County Council~~	N/A - No longer required as borrow pits not included in the DCO

The revised table shows that there are unlikely to be any other consent or licences relating to the HRA within the ZoI, except a waste management licence may be required.

2.2.4 Impacts acting in combination

2.2.4.1 Introduction

The IPC HRA advice note ten ("HRA relevant to nationally significant infrastructure projects") states that the developer will need to conclude whether a project is likely to have "*potential likely significant effects on European sites, either alone or in combination with other plans or projects*". This section of the addendum will seek to clarify whether there may be any effects on the Wensum SAC that will be produced by the NDR in-combination with other future developments and whether they are likely to be significant. Together, these incremental changes are considered under the heading of "in-combination effects".

Impacts acting in combination with the NDR were considered in Paragraph D.3.8 and Table D.3 in the DCO HRA. As requested by Natural England additional information has been provided in this Addendum to present these potential impacts in more detail.

2.2.4.2 Future developments in addition to the NDR

A range of major developments in the Norwich area were identified within the NDR Environmental Statement (Volume 1, Chapter 15; Document Ref 6.2) based on the criteria in Table 2.3 below. Generally developments were included if they were thought likely to be followed through.

Table 2.3: Criteria for inclusion or exclusion in the in-combination effects assessment.

Certainty of outcome	Development status
Near certain: the outcome will happen or there is a high probability of it occurring.	• Intent announced by proponent to regulatory agencies. • Approved development proposals. • Projects under construction.

Certainty of outcome	Development status
More than likely: the outcome is likely to happen but some uncertainty.	• Development application within the consent process and in accordance with development plan. • Development conditional upon the transport strategy/project proceeding.
Reasonably foreseeable: the outcome may happen but significant uncertainty.	• Identified within a development plan and, although not directly associated with the transport project, may occur if the project is implemented.
Hypothetical: there is considerable uncertainty whether the outcome would ever happen.	• Conjecture based upon currently available information. • Discussed on a conceptual basis. • One of a number of possible inputs in an initial consultation process.

Source: Highways Agency Interim Advice Note 81/06, Assessment and Management of Environmental Effects

According to these criteria the following developments have been identified for inclusion within the in-combination effects assessment. These are developments that either have planning permission or partial planning permission or are locations for housing and commercial properties allocated for some years. Brief summaries of each development are shown in the table below. Further details are presented in the NDR Environmental Statement, Volume 1, Chapter 15, Section 5. The likelihood of these developments to have an in-combination effect with the NDR on the Wensum SAC is presented in Table 2.4.

Table 2.4: Developments assessed with the NDR for potential in-combination effects on the River Wensum SAC.

Development / strategy	Approx. nearest NDR chainage	Certain	More than likely	Reasonably foreseeable / hypothetical	Not likely
Beyond Green: Incorporates 3,520 houses, 1,000 jobs and local shops and services at North Sprowston and Old Catton (NS&OC)	12,500				X
Rackheath Eco Community: Mixed-use community offering employment, day-to-day services, and public transport in addition to the 4,150 houses.	14,250				X
Broadland Gate: Mixed- use houses and commercial development.	19,500				X
Norwich Airport: Engine testing centre.	7,500				X
Norwich Airport: Aviation Business Park 850,000 sq ft.	10,000				X
Laurel Farm and Brook Farm: 600 homes and commercial development.	19,000				X

Development / strategy	Approx. nearest NDR chainage	Certain	More than likely	Reasonably foreseeable / hypothetical	Not likely
Blue Boar Lane (White House Farm): 1233 houses.	14,250				X
Norwich Area Transport Strategy (NATS)	Entire route	X			
Proposed JCS housing allocation for 4000 homes to the north west of Norwich (at present exact location unknown).	Unknown	X (JCS adopted 10th Jan 2014)			

Source: Adapted/updated from NDR Environmental Statement Volume 1, Chapter 15, Table 15.4.

2.2.4.3 Assessment of in-combination effects

Those projects beyond chainage 1750m are considered not likely to cause significant adverse effects due to the distance and lack of pathways connecting the areas to the River Wensum.

In-combination effects on the Wensum SAC that could potentially arise from the NDR along with NATS or the JCS proposals could include:

- Reduced river flows due to increased water abstraction from an increased number of domestic residences;
- Increased turbidity due to enhanced silt ingress from construction operations and enhanced traffic flows (with corresponding erosion of roadside verges).

The former possibility has already been discussed in the HRA report addendum produced for the JCS which focused on water resource availability in Greater Norwich. This study found that water demand figures (which took account of population, per capita demand, non-household demand, leakage, and the JCS housing trajectory) showed an overall change that was insignificant, and that Anglian Water was in a position to meet water demands without the need for any increase in abstraction. In conjunction with this, the Environment Agency is in the process of a programme of a phased reduction to water abstraction limits in the area. This means that any in-combination effects between the NDR and other developments are not deemed significant (see http://www.gndp.org.uk/content/wp-content/uploads/downloads/2013/02/SDJCS10.2-JCS-HRA-Addendum-June-2012.pdf).

The potential impact of sediment ingress into the Wensum as a result of changing traffic flows (from verge erosion) from the NDR and other developments has been considered in Chapter 3, as the traffic model is based on the inclusion of future developments such as the JCS. It is also expected that any other new developments will include sustainable urban drainage systems (SUDS) to mitigate against silt ingress, and appropriate measures will be required to prevent silt ingress during construction. The Wensum SAC will not therefore be subject to any significant in-combination impacts from the NDR acting with the other developments list above. The effects of the NDR on sediment transport to the Wensum SAC are discussed in more detail in Chapter 3 and 5 of this addendum.

2.3 Consultation responses to the draft Addendum to the HRA (Revision A)

This Addendum to the HRA was first issued to the Environment Agency and Natural England for review in May 2014. Responses were received and have been considered within this revision of the Addendum to the HRA (Revision B). Comments were provided in their formal letter responses dated 23rd May 2014 from

the Environment Agency and 2nd June 2014 from Natural England. The letters are presented in Appendix A.

A summary of key comments is provided in Table 2.5. This revision to the Addendum to the HRA (Revision B) addresses these comments in the sections detailed below.

Table 2.5: Environment Agency and Natural England consultation responses to draft Addendum to the HRA (Revision A)

Consultation responses	Addendum Rev B report reference
Sediment ingress	
A precautionary approach should be adopted when considering impacts on the River Wensum Special Area of Conservation. A detailed mitigation plan to reduce the impacts of silt ingress at these locations should therefore be proposed. This should look proactively (rather than reactively) at the existing run-off management and pollution prevention measures, as well as identifying opportunities for local betterment through the installation of measures such as new SuDS features. The mitigation plan should set out in detail the proposed inspection regimes, what action is proposed at each site, the timings of actions, who is the responsible authority and who will fund the work.	Section 3.8
Norfolk County Council's current maintenance regime and HGV restrictions on some of the road network do not represent a sufficiently robust mitigation strategy for silt. The proposed mitigation measures are not robust enough to remove any adverse effects, and therefore it cannot be concluded that no further assessment or mitigation measures are required.	Section 3.8.2
Modelled reductions in traffic flows in other minor roads (e.g. Ringland Road, Taverham Lane or Costessey Lane) should not be used to offset the likely increases elsewhere.	Beneficial rather than cumulative effects presented in Section 3.7
Please check the accuracy of the traffic data provided in Table 3.1 as some of the figures relating to the percentage difference do not appear to be correct.	Section 3.5*
Detailed information about funding, how, when, where and by whom the potential mitigation measures are implemented is required. Without this information it cannot be concluded that the measures would remove any adverse effects.	Section 3.8
The county council should confirm how it will ensure appropriate ditch maintenance in the long-term.	Section 3.8.2
Groundwater levels and protection	
The importance of the receiving waters has not been fully considered in the application of the DMRB risk assessment method (Method C). The receiving groundwater is resting within a regionally important Principal Aquifer which supports the Wensum SAC, and as such would be designated as a feature of Very High Importance (HD 45/09, Table A4.3) and could result in effects that are Large Adverse or Moderate Adverse (Table A4.6).	Section 4.2.3. Table C.2 and Figure C.3 in Appendix C.
The Environment Agency considers that the swales should be lined at Drainage Network 1 (draining to Lagoon 1) due to the limited extent of the clay rich geology in the vicinity of this area putting the discharge into the 'Medium Risk' category. More than one treatment stage would therefore be required.	

**Calculated as difference between 2032 DS and DM, divided by the DM, multiplied by 100.*

2.4 Further consultation with Natural England and the Environment Agency

A second revision (Revision B) of this Addendum to the HRA was issued to the Environment Agency and Natural England for review in July 2014. Responses were received and have been considered within this final revision of the Addendum to the HRA (Revision C). Comments were provided in their joint formal letter of response dated 27th August 2014. The letters are presented in Appendix A.

A list of other meetings, site visits, emails and teleconferences that have occurred since the first revision of this report was submitted to the Environment Agency and Natural England is presented in Table A.1 in Appendix A and record copies of this communication is also provided in Appendix A.

The main outstanding concern from the Environment Agency and Natural England's joint letter dated 27th August 2014, in response to Revision B of this report, is the measures required along three road crossings of the River Wensum where silt ingress could increase as a result of increased traffic from the NDR. These three roads include: A1067 at Attlebridge, A1067 at Lenwade and Weston Hall Road.

A site visit took place on 16th July 2014 with Environment Agency representatives (Rob Dryden and Adam Thurtle) to agree on the betterment and mitigation measures required along these road sections to enable the conclusion of 'no adverse effect on site integrity'. Following the site visits the final measures were agreed with Natural England and the Environment Agency (see relevant emails in Appendix A). Norfolk Wildlife Trust were also consulted and agreed to the proposals in relation to the potential impact on Weston Meadows County Wildlife Site.

These measures are to be set out, implemented, monitored and managed through a Mitigation Measures Action Plan (MMAP). The framework of the MMAP has been agreed with the Environment Agency and Natural England. We are in the process of writing the MMAP which will be finalised before the end of November 2014. Beyond the MMAP there are no other outstanding issues.

3. Surface water quality

3.1 Introduction

The potential for the NDR to increase sediment ingress into the River Wensum SAC was considered in the DCO HRA. This issue was introduced in Paragraphs B.4.12 to B.4.18; considered further in terms of sediment laden run-off reaching the river during the NDR construction (Paragraphs D.2.6 to D.2.12); and from the NDR and other roads directly or indirectly draining to the river (Paragraphs D.2.33 to D.2.39).

A more detailed assessment has been conducted to inform this addendum, considering comments from Natural England and the Environment Agency on both the DCO HRA and Revision A of this Addendum to the HRA (Appendix A).

Natural England recognises that sediment entering the river, contributing to the unfavourable conditions, is largely from runoff from arable land, however once it enters the highway, Norfolk County Council (NCC) are required to address any potential adverse effects as the relevant highways authority. Adverse effects resulting from the operation of the NDR through increased traffic flows across roads draining directly or indirectly to the river are considered in this section.

3.2 Revised approach

The DCO HRA assessment on the potential impacts of sediment ingress on the River Wensum SAC as a result of the NDR has been amended as follows:

- Consideration of more recent research and studies into sediment ingress from roads within the Wensum valley of relevance to this assessment (Section 3.3);
- Extension of the ZoI to consider impacts on the SAC further upstream (see Section 3.4), limited by available and reliable traffic data (Section 3.5);
- Provision of a detailed road drainage survey methodology for a new site survey, targeting a day that followed a period of prolonged rainfall in order to identify surface water pooling and discharges accurately (see Section 3.2), with the experience of surveyors and weather conditions stated; and
- A review of the likely significance of effects of sediment ingress and overall conclusions (Section 3.7 to 3.8.2 and 6).

The Stage 1 assessment in the DCO HRA identified changes in water chemistry and siltation to have a potential significant adverse effect on all European site features during NDR construction and operation (see Table 4.2). This potential adverse effect can result from increased traffic increasing verge erosion, but also an increase in contaminants and sediment within the road runoff and potential increase in spillage risk due to any increase in HGVs.

As presented in Paragraph D.3.5, the River Wensum Site of Special Scientific Interest (SSSI) Unit 53 is in unfavourable declining condition (see citation in Appendix E) therefore the potential effect of increased sediment ingress on this unit has also been considered where applicable.

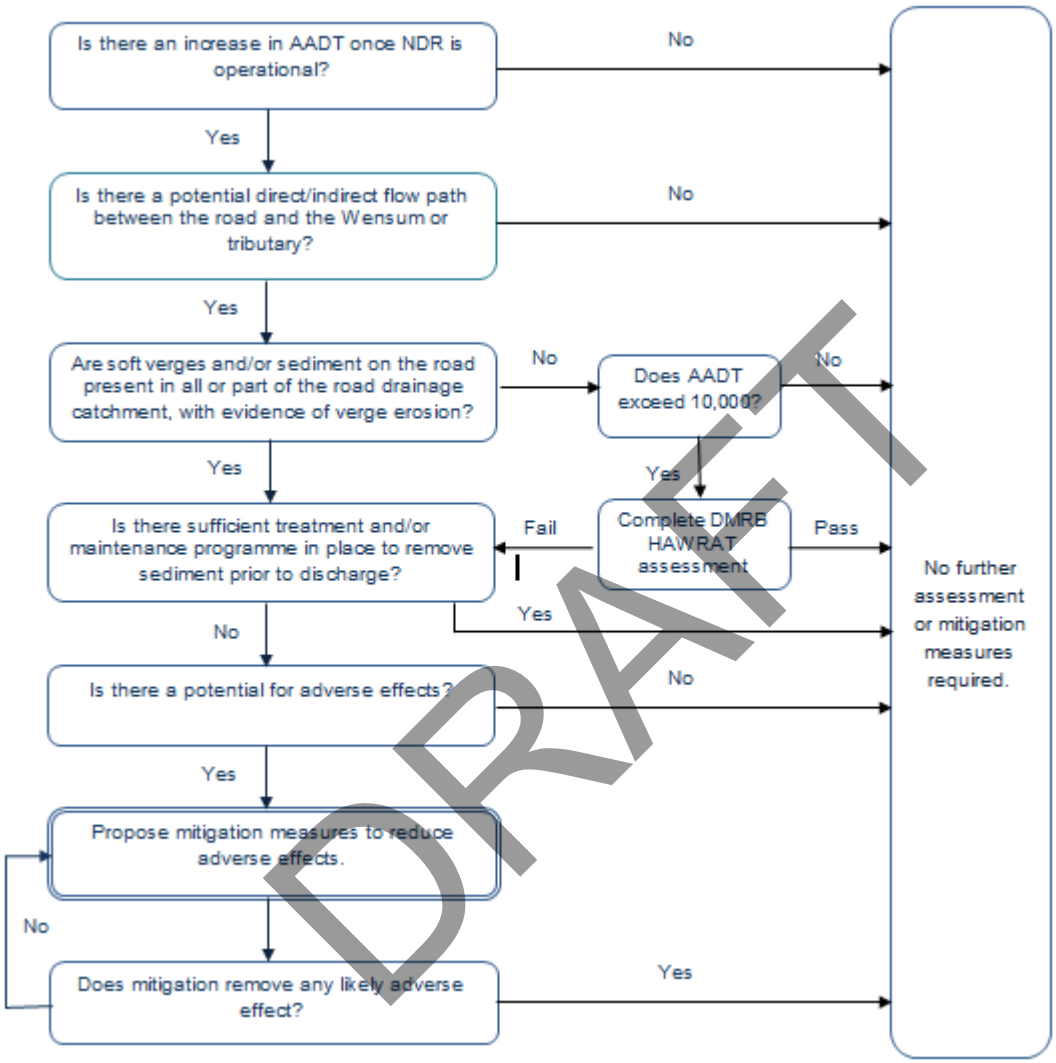
An attempt has then been made to correlate changes in traffic with likely adverse or beneficial impacts of sediment ingress and water quality in the Wensum. In analysing the impacts of traffic it was also important

to identify which of the key off-roads contributed the greatest sediment ingress into the Wensum. Predicted changes in traffic volumes were then compared for each key off-road to see how sediment loads may change. Increased traffic is likely to result in greater erosion of the roadside verges leading to greater levels of silt entering the Wensum via road runoff, if not mitigated for. Likewise, a reduction in traffic is likely to reduce verge erosion reducing sediment loads entering the river. An assessment process has been created to identify locations where significant adverse effects are likely and when mitigation measures may be required, as set out in Figure 3.1.

Pollution impacts from routine runoff on receiving waters appear to be broadly correlated with Annual Average Daily Traffic (AADT). As suggested within the Design Manual for Roads and Bridges Vol 11 Section 3 Road Drainage and the Water Environment (HD45/09) studies have shown AADT of less than 10,000 as unlikely to give rise to significant pollution impacts (pollutants occur in lower concentrations). For this assessment where AADT exceeds 10,000 the Highways Agency Water Risk Assessment Tool (HAWRAT) will be used to assess the potential impact of contaminant loads (from vehicles rather than road verges) on the River Wensum SAC.

The in-combination and cumulative effects of road runoff on the River Wensum has also been addressed.

Figure 3.1: Process to assess likely significance of effect of sediment ingress for each road



3.3 Previous studies on sediment ingress

The relevance of the River Wensum Restoration Strategy (NE, 2009) and its supporting Geomorphological Appraisal (NE, 2006) to this assessment is presented in paragraphs B.4.38, D.2.36 and D.3.6 of the DCO HRA. The Strategy describes sediment ingress to the River Wensum from a number of sources including runoff from eroding arable field and pasture, roadside verges, heavily stocked floodplain meadows, pig farm units, and recently cleared drains. Points of ingress can occur where runoff from the catchment surface intersects with the main channel, possibly via a drainage network or road system. Although the tributaries of the Wensum provide the main source of silt to the River, the road network can become an extension of the drainage system, acting as a conduit for the transportation of sediments between the wider catchment sources and the Wensum or its tributaries, particularly during rainfall events.

Sediment ingress points identified in the Geomorphological Appraisal (NE 2006) are presented in Figure 4 of the River Wensum Restoration Strategy (Natural England 2009), and remain the same as those presented on Drawing No. MMD-233906-DT-0722 (Appendix G.1 of the DCO HRA). However, due to the extended ZoI, a further three ingress points have been added along the River between Lyng and Lenwade, and two ingress points downstream of Dereham Road, near Swanton Morley. All sediment ingress points and associated sediment types are presented on Drawing No. MMD-233906-DT-0995 (Appendix B). Overall, fine sized sediments are the main source of materials from the catchment.

An APEM survey found, using a sediment tracing methodology, that roads contributed a significant proportion of fine sediment inputs in the Wensum catchment between Great Ryburgh to Lenwade and the tributaries within this section (APEM 2011). Sources were graded into three grades of severity, with Grade 1 being most severe – '*Observed (or potential for) widespread deposition of in-stream sediment causing localised and widespread impacts more than 100 m from the point or diffuse source*.' The survey found that conduits such as roads, farm tracks, drainage ditches accounted for 40 % of Grade 1 sources in this upper section of the Wensum.

A study by Evans (2011) considered diffuse water pollution to the River Wensum, with a particular focus on sediment ingress from roads and tracks based on road verge type and condition, and the connectivity to the Wensum or its tributaries. Evans (2011) concluded that sediment runoff from roads only provided relatively minor contributions of diffuse water pollution; with reference to findings by Collin et al. (2011) where a 'fingerprinting' techniques demonstrated that for parts of the Wensum catchment channel banks and other subsurface sources contribute 45 % of the sediment lying on the floor of the Wensum, pasture land contributed 47%, arable land 7% and only 1% from roadside verges. Evans (2011) suggests it is probable that only a small proportion of sand moving down the river is from eroding fields or roads and tracks or where animals cross watercourses, rather it is more likely to come from "*eroding banks, initiated by disturbance, flood flows or animals, or, more rarely, incising channel beds*".

A recent study was commissioned by Natural England to improve understanding of the contribution of sediment ingress via runoff from roads (such as verge erosion and tyre wash) for the River Wensum and North Norfolk Rivers (APEM, 2013). The study aided the prioritisation of management measures as sources were identified and categorised by severity. Again, road crossing points were identified as a diffuse water pollution problem in the Wensum catchment, with sediment directly entering the river from progressive erosion of road verges (influenced by changing traffic volumes and vehicle size) or providing a conduit by which diffuse pollution from other origins, such as farmyard runoff or arable fields, may be transported. Larger and heavier machinery are now using the highways as a result of agricultural intensification, resulting in both vehicular erosion and transport of sediment from fields. This study considered five crossing points within the ZoI and of relevance to this assessment including Dereham Road (Site 1), Mill Street (Site 2) and Lyng Road (Site 3), plus two additional sites not surveyed (within the ZoI) along a tributary of the Wensum at Billingford (referred to in the report as the 'Lyng Forge' catchment). It was concluded that there were no diffuse water pollution issues at these sites therefore no management measures were proposed.

However, the Environment Agency's '*Impact of Highways Drainage from Rural Roads, Lyng, Norfolk'* (Report version 2 July 2013) concludes differently for Site 3, Lyng Road. Here a highway drain discharges road runoff to a tributary of the Wensum. (This site was previously identified in the Geomorphological Appraisal (NE, 2006) as an ingress point for sand and fine sediment.) Two monitoring points were installed by the Environment Agency to measure changes in turbidity up and downstream of this highway drain. The results showed significant differences between turbidity, with higher levels observed downstream of the drainage outfall. Correlations between rainfall, water level, water quality and turbidity suggest the highway

drain is causing a significant increase in sediment load in the River, and is likely to continue to contribute towards a failure of the quality targets set for the river. The study identifies the need to consider cumulative effects of all discharges of road runoff as a potential sediment source and sustainable drainage systems installed to remove or reduce sediment concentrations prior to discharge.

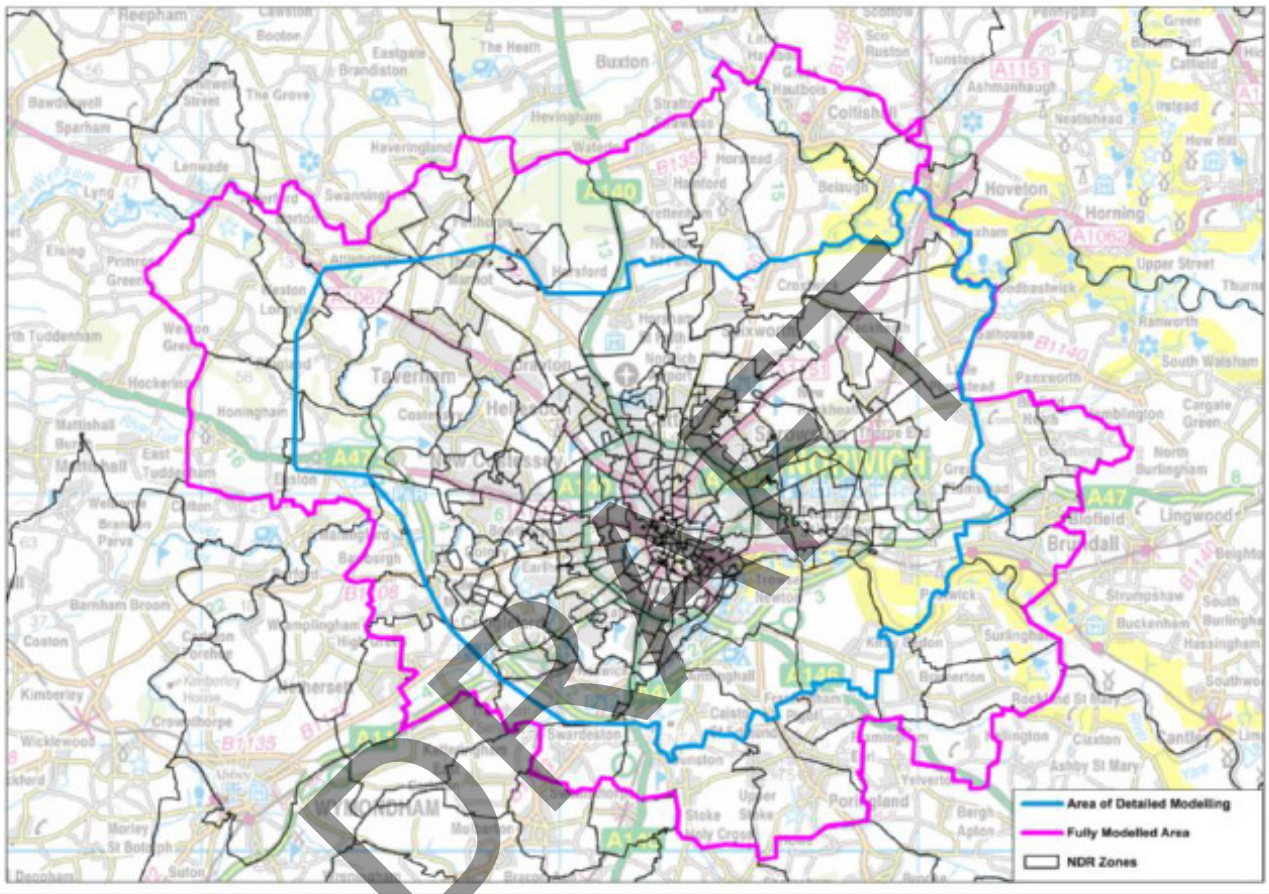
To apportion sediment sources is not an easy task but is an important consideration when concluding the overall significance of effect of increased sediment ingress from roads as a result of the operational NDR. Some of the contradicting findings between these various studies on how much road runoff contributes to high turbidity in the Wensum at each road crossing point demonstrate the complexity of this assessment.

3.4 Zone of influence

The Zone of Influence (ZoI) needs to consider the potential impact of changing traffic flows on water quality and sediment ingress in the River Wensum as a result of the NDR. The revised ZoI considers all roads crossing or draining (directly or indirectly) to the River Wensum, up and downstream of the point where the NDR connects to the A1067 Fakenham Road. The downstream extent of the ZoI has been determined by creating a 500m buffer surrounding the south-eastern extent of the River Wensum SAC boundary. The upstream extent of the ZoI is defined by limitations to the traffic model, limited to a 500m buffer from the bridge along Dereham Road, Swanton Morley. The ZoI is shown on Drawing No. MMD-233906-DT-0995 (Appendix B).

The ZoI is influenced by the validity of the traffic model, which decreases with distance from Norwich City centre. Figure 4.1 within the “Highway Model – Local Model Validation Report” (Document Ref. 5.9), presented here in, shows two mains areas defined within the model. Firstly, the ‘Fully Modelled Area’ within which the proposed interventions have influence. This is subdivided into an ‘Area of Detailed Modelling’ within which significant impacts of interventions are certain. This considers the River Wensum SAC between its south-eastern extent and the upstream A1067 crossing at Attlebridge. The rest of the Fully Modelled Area is where the impacts of interventions are considered to be quite likely, but relatively weak in magnitude, which considers the SAC between A1067 at Attlebridge and Lenwade. Outside the fully modelled areas the network representation in the model is less detailed and has not been validated. The impacts of interventions in this area can be assumed to be negligible. As this assessment is reliant on the validity of traffic data, the upstream extent of the ZoI has been limited to Dereham Road, but traffic data for road crossings upstream of the A1067 at Lenwade should be considered with caution.

Figure 3.2: Modelled areas (Figure 4.1, Document Ref. 5.9)



3.5 Traffic data

Traffic data presented in Table D.1 of the DCO HRA has been reviewed. Where available and considered valid, traffic data for all roads potentially draining to the Wensum within the extended ZoI is presented in Table 3.1 and on Drawing No. MMD-233906-DT-0995 (Appendix B). In Table 3.1, traffic data is presented as Annual Average Daily Traffic (AADT) and percentage Heavy Goods Vehicles (HGVs). Percentage variation in traffic between the Do Minimum (no NDR) and Do Something (with NDR), and between 2017 (opening year) and 2032 is provided, along with differences in number of HGVs. HGVs are considered more likely to cause damage and erosion to road verges where exposed, therefore any changes to HGV numbers are believed important.

As per Table 3.1 the AADT is predicted to rise significantly (+>10% or +>500 vehicles per day) on three individual roads by 2032, with NDR in place: A1067 at Attlebridge, A1067 at Lenwade and Marl Hill Road. Significant increases in the number of HGVs along these three roads. An increase in AADT of 277 vehicles per day (+8.4%) is also predicted on Weston Hall Road by 2032. Significant decreases (->10% or ->500

vehicles per day) in AADT by 2032 are predicted along Ringland Road, Taverham Lane and Low Road, with a significant decrease in HGVs along Low Road also (~67%). A decrease in HGVs is predicted along Dereham Road and Weston Hall Road.

Section 3.7 considers the relevance of this traffic variation based on the presence of links between these roads and the River Wensum. Section 3.7.1 considers the cumulative effects of changing traffic flows across the SAC within the ZoI, comparing only roads thought to be linked and draining to the River Wensum.

Table 3.1: Traffic Data

	AADT 2017			AADT 2032			Number of HGVs 2017			Number of HGVs 2032		
Location	**DM**	**DS**	**Difference (% difference)**	**DM**	**DS**	**Difference (% difference)**	**DM**	**DS**	**Difference (% difference)**	**DM**	**DS**	**Difference (% difference)**
B1147 Dereham Road	2344	2297	-47 (-2%)	2999	2876	-123 (-4.1%	131	131	0 (0%)	168	160	-8 (-4.8%)
Mill Street	-	-	-	-	-	-	-	-	-	-	-	-
Lyng Road	0	0		0	0	0	0	0	0 (0%)	0	0	0
A1067 at Lenwade	10,347	12,188	+1841 (+17.8%)	12,887	15,841 (+22.9%)	+2954 (+22.9%)	431	490	+59 (+13.7%)	456	625	+169 (+37.1%)
Weston Hall Road	3383	3490	+107 (+3.2%)	3279	3556	+277 (+8.4%)	66	62	-4 (-6.1%)	92	86	-6 (-6.5%)
Marl Hill Road	1674	3317	+1643 (+98.1%)	3146	5549	+ 2403 (+76.4%)	49	81	+32 (+65.3%)	102	187	+85 (+83.3%)
A1067 at Attlebridge	9999	15,360	+5361 (+53.6%)	12,245	19,916	+7671 (+62.6%)	557	653	+96 (+17.2%)	618	876	+258 (+41.7%)
Ringland Road	4907	3454	-1453 (-29.6%)	7973	6302	-1671 (-21%)	0	0	0 (0%)	0	0	0
Costessey Lane (Ringland)	0	0	0 (0%)	10	0 (-100%)	-10	0	0	0 (0%)	0	0	0
Taverham Lane	5723	4727	-996 (-17.4%)	6199	4740	-1459 (-23.5%)	0	0	0 (0%)	0	0	0
Costessey Lane	3951	3758	-193 (-4.9%)	4771	4865	+94 (+2%)	0	0	0 (0%)	0	0	0
Low Road	4595	4044	-551 (-12%)	4906	4083	-823 (-16.8%)	28	9	-19 (-67.9%)	85	28	-57 (-67.1%)

Table key: Significant increase in traffic; Significant decrease in traffic

3.6 Site visit and drainage surveys

3.6.1 Survey methodology

A desk based assessment identified roads directly crossing or potentially draining to the River Wensum based on OS map data and results from previous research papers (see Section 3.3). Sites were identified as requiring further site investigation to identify road drainage and potential pathways to the River Wensum as shown on Drawing No. MMD-233906-DT-0955 (Appendix B).

The first survey took place on 29th January 2014 by two surveyors, one of whom has over 7 years' experience working on road schemes and has a good understanding of drainage design and structures. The date was selected based on a weather forecast showing prolonged periods of rainfall during the previous day and night. Although no rain fell during the site visit, roads showed pooling of rainwater and aided identification of potential pathways, along with an appreciation of ditch and river conditions when water levels are high. The previous survey undertaken for the DCO HRA was undertaken in the summer months.

On site, the following aspects were considered:

- Presence of formal drainage system e.g. kerbs and gullies;
- Presence of soil on the road;
- Presence of soft verges and evidence of verge damage by vehicles;
- Flow down the road and pooling;
- Direct or indirect connection between road and channel;
- Connecting ditches and sediment accumulation within ditches and/or at outfall points; and
- Evidence of river channel and bank erosion up and downstream.

A second site survey was considered necessary to revisit four locations due to the notable increase in traffic and the potential direct or indirect discharges to the Wensum including A1067 at Lenwade, Weston Hall Road, A1067 at Attlebridge and Marl Hill Road. A member of Norfolk County Council's (NCCs) Highways team and NCC's NDR Drainage Engineer came to provide technical understanding and local knowledge of the systems in place and any existing or historical issues. The NCC Highways team provided drainage plans for Marl Hill Road and A1067/The Street (Appendix B). A validation process for drainage systems shown on the plans was undertaken to prove what was happening on site.

A third survey took place on 1st April 2014 along Weston Hall Road. The aim of the survey was to meet with the landowners to identify ditches receiving road runoff from Weston Hall Road, the ownership of these ditches and any maintenance responsibilities. The flow routes of the ditches were also identified, as was how the ditches connect to the River Wensum and what treatment to reduce sediment is already in place. The site observations are described in Section 3.6.2 and shown on Drawing No. MMD-233906-DT-1003 (Appendix B).

3.6.2 Survey results

Site maps and photographs are presented on Drawing No. MMD-233906-DT-0999-1010 (Appendix B). Site observations are provided in Table B.1 (Appendix B), with a summary of findings alongside observations during the second site visit presented in this section.

No direct or indirect discharges to the Wensum were observed at three out of the 12 road crossings; Marl Hill Road, Costessey Lane and Low Road. In two locations, only short sections of road were likely to drain to the river, flowing across fields between the road and the river (Dereham Road and Mill Street).

High levels of sediment were visible along Lyng road, with no visible structures to capture runoff or outfalls (probably due to the high water levels) to suggest a direct or indirect discharge. However, the study by the Environment Agency identified a positive outfall draining to the Wensum. Further information on the study is provided in Section 3.3.

Direct discharges are likely along the A1067 at Lenwade and Attlebridge, although the outfall structures were not easily recognisable, rather predicted due to a lack of alternative structures to receive the runoff, such as a soakaway. A slipway was observed at the A1067 at Attlebridge and accumulated sediment visible within the receiving ditch (a tributary of the Wensum). This was later confirmed by NCC Highways team as shown on the drainage plans in Section B.3 (Appendix B). The drainage catchment to the west and east of the low point (the bridge crossings), up to the likely high points along the road, provide alternative drainage systems such as grips cut through the verges and directed to grassed or stone-filled soakaways, The area of A1067 draining to this discharge point is therefore likely to be relatively small (<1ha).

Marl Hill Road had two manhole covers at the northern extent, just south of the A1067 junction at Attlebridge. Grips channelling road runoff to a short section of ditch (~50m) appeared to act as a soakaway type structure. The road elevation along Marl Hill Road suggest during heavy rainfall runoff would flow southwards away from the A1067 and away from the River Wensum or connecting ditch or tributary. However, NCC provided a drainage plan of the area that suggested pipe work connecting the soakaway to a ditch some 200m to the east that eventually flowed into the River Wensum via a series of field ditches (see Section B.3 in Appendix B). Site observations during the second survey confirmed no pipe work connecting the soakaway structure to the ditch. Even if the pipe was discharging into the ditch, there is sufficient distance and vegetation within the ditches to remove sediment before it reaches the Wensum.

A series of grips were observed along Weston Hall Road that flowed into two ditches connected to the Wensum (see Drawing No. MMD-233906-DT-1003 in Appendix B). One ditch flows along the east side of Weston Hall Road, opposite the entrance to Weston Hall, flowing under the road just before the entrance to the Dinosaur Park. This ditch along the road was heavily silted up and its base was at or just below the road level (see Photo 3.1 below). Beyond the culvert the water flows through the Weston Hall grounds via the moat and various sluices and vegetated areas (reeds) before discharging to the Wensum. Sediment removal is likely to take place as the water flows through these structures and vegetation.

North of this culvert, road runoff enters a second ditch that flows along the western side of the road via a series of grips cut under the fence. The entrance of the grips was visible but most was hidden by the fence (see Photo 3.2 below). The bed of the channel was largely gravel substrate with little evidence of sediment accumulation. Old sediment or litter traps were evident between the grips and the ditch that were no longer functional (Photo 27 on Drawing R1C093-R1-4914 in Appendix G). Water in this ditch discharges into the first ditch just before the final sluice and prior to its discharge to the Wensum. Little vegetative treatment was evident, although a large area of reeds exists between the final sluice and its confluence with the Wensum. Further information and assessment is presented in Section 3.7 and presented on Drawings R1C093-R1-4909-4917 (Appendix G).

Photo 3.1: Grips directing road runoff to ditch opposite entrance to Weston Hall, with evidence of sediment accumulation in ditch.

Photo 3.2: Grips under fence (white arrows) between Weston Hall and A1067, draining to a ditch which flows to the Wensum.

Direct discharges were also observed along a short section along Costessey Lane, Ringland, where the road runs adjacent to the river. Grips cut into the banks create a direct connection between the road and the Wensum.

Indirect discharges were observed at Ringland Road and Taverham Lane, where existing in-channel vegetation is likely to provide some sediment removal prior to discharge to the Wensum.

The presence and erosion of soft verges were evident along all roads except the A1067 which is largely kerbed along the bridge sections. Grass verges were observed in sections further from the river crossing point and potentially within the same road drainage catchment.

Evidence of bank erosion and sediment accumulation within the river was difficult to observe during the site visits due to the high turbidity in the river and high river levels, often reaching above bank heights.

3.7 Impact assessment

Based on the AADT figures for 2032 DS the data shows a significant decrease in traffic flows along roads where verge erosion is an existing issue and where there is a connection to the River Wensum; namely Ringland Road and Taverham Lane. Decreases in traffic along Dereham Road and Costessey Lane, Ringland are also predicted. The reduction in traffic along these routes is likely to reduce sediment ingress to the River Wensum through the reduction in verge erosion.

Following the impact assessment process set out in Figure 3.1 only three roads show a notable increase in AADT when NDR is operational (see traffic data in Table 3.1), including:

- A1067 at Lenwade;
- A1067 at Atttlebridge; and
- Marl Hill Road.

Along these three roads a potential direct or indirect flow path between the road and the Wensum is likely along the A1067 but not along Marl Hill Road. The lack of connection between Marl Hill Road and the Wensum is discussed in Section 3.6.2 above and shown on Figure B.1 (Appendix B).

Although there is a significant increase in traffic along the A1067 and some stretches of grass verges, an increase in traffic is unlikely to increase verge erosion due to the distance between the edge of the road and the road verge (only infrequent tracking over verge likely). However, following the assessment process set out in Figure 3.1, the forecasted AADT triggers the need to use the Highways Agency Water Risk Assessment Tool (HAWRAT, Method A) for the A1067 at Lenwade and Attlebridge (AADT>10,000). This tool identifies whether there is a potential adverse effect on surface water quality as a result of road runoff and identifies the need for any mitigation measures. The method of assessment takes a two-step approach to the assessment as described in paragraph D.2.27 of the DCO HRA.

Both road drainage catchments failed Step 1 so a more detailed assessment (Step 2) is required for further comparison with pollutant thresholds. Data used for the Step 1 and 2 assessment are presented in Table C.1 in Appendix C.

Step 2 considers the area of road draining to the outfall. The existing road drainage catchments were estimated through identifying likely high points along the road. In both catchments the low point is located where the road crosses the River Wensum. These are presented on Drawings MMD-233906-DT-1002 (Lenwade) and MMD-233906-DT-1005 (Attlebridge) in Appendix B. It is predicted (but not confirmed) that road runoff from the A1067 at Lenwade discharges directly to the River Wensum. The entire road drainage catchment along the A1067 at Attlebridge is assumed to discharge to the tributary of the River Wensum via the slipway. It was assumed no permeable areas contributed to the flows at the outfall, providing a conservative risk assessment (no further dilution).

Step 2 also considers the flow rate of the receiving watercourse and physical dimensions to calculate the available dilution of soluble pollutants and dispersion of sediments. Lenwade and Attlebridge are located between two flow gauged stations along the River Wensum; Swanton Morley (TG020184) and Costessey Mill (TG176127). The Centre for Ecology and Hydrology (CEH) website provides river flow characteristics to be used within HAWRAT, including the Base Flow Index (BFI) and the low flow condition (Q95). Both sites have a BFI of 0.75. The Q95 was recorded as 0.922m^3/sec at Swanton Morley compared to 1.322m^3/sec at Costessey Mill. Based on distance from nearest gauging station, Swanton Morley data was used to represent river flows at Lenwade and flow characteristics were estimated for the tributary of the Wensum at Attlebridge (due to lack of available data and time to take *in situ* measurements).

HAWRAT Step 2 results indicate that the quantities of both soluble substances (copper and zinc) and sediment entering surface water are acceptable (a “pass”) (see Figure C.1 and C.2 in Appendix C). This judgement does not allow for dilution of runoff from permeable areas draining to the road catchment or the contribution of grassed soakaways allowing attenuation and treatment of runoff prior to it reaching the outfall to the river. No further assessment or mitigation is required to treat runoff from these catchments.

An assessment has been made using the HD45/09 method for calculating the risks of spillages and pollution incidents occurring. The return period for a spillage along A1067 at Lenwade that resulted in pollution is calculated to be about 1: 4202 years (see Figure C.1 in Appendix C). The return period for a spillage along A1067 at Attlebridge that resulted in pollution is calculated to be about 1:5126 years (see Figure C.2 in Appendix C). The acceptable return period in road design is 1:200 for areas where spillage could affect a protected area. Following the methodology outlined in Figure 3.1, no further assessment or mitigation would therefore be required to reduce the risk of pollution occurring from accidental spillage.

In the Environment Agency's response to the draft Addendum to the HRA (Revisions A and B), however, it was requested that a precautionary approach is adopted when considering impacts of increased sediment or contaminants on the River Wensum SAC, where any adverse impact could potentially impact on the SAC. However, the level of risk associated with accidental spillage and contaminants associated with road runoff with increased traffic is considered low as explained above. Mitigation measures developed for the A1067 at Attlebridge and Lenwade are therefore focussed on a monitoring and maintenance regime only, whereas additional mitigation in terms of improvements to the existing drainage design has been proposed at Weston Hall Road (see Section 3.8 below regarding the generation of a Mitigation Measures Action Plan).

3.7.1 Cumulative effects

The cumulative effect of other developments with the NDR is incorporated within the traffic model and therefore already considered within this assessment.

The improved link road between the A1067 and the A47 addresses previous HGV problems by diverting HGVs away from the villages of Weston Longville and Hockering (see Drawing 233895-MN-038 in Appendix G). The link road improvements have been completed, with the reclassification of the road to a B road and an accompanying HGV ban to be implemented in Hockering in December 2014. Additional traffic management and/or signage will be used to encourage all traffic onto this improved HGV route. Marl Hill Road has a 6' 6'' width restriction (restriction runs from A1067 through Weston Longville to Walnut Tree Lane), so this means HGVs already use Weston Hall Road. The aim is to deter commuters and light goods vehicles from using Marl Hill Road, although this route is approx. 4km longer so we expect a high proportion of vehicles will continue to use this route rather than using the improved link road route.

This cumulative effect of the NDR with the improved link road could present changes in contaminant and sediment loads to the River Wensum. The traffic model did consider and take into account the removal of HGVs from alternatives routes, such as the roads through Weston Longville, however the HGV ban implemented along the northern section of Marl Hill Road (junction with A1067) was not. AADT and %HGV flows have therefore been amended with the conservative assumption that HGVs along the northern section of Marl Hill Road will transfer to Weston Hall Road as presented in Table 3.2. The table shows a difference in AADT in 2032 for the 'DS plus Link Road' compared to the 'DS without link road' scenario of +5.26% along Weston Hall Road and -3.37% on Marl Hill Road. This results in an increase in AADT of 10.71% for the NDR DS scenario (with Link Road) by 2032, which means the increase (>10%) could now have a potential significant effect on the River Wensum. HGV numbers more than triple along Weston Hall Road in 2032 (+187 HGVs per day) as expected with the new HGV route proposed.

Weston Hall Road has soft grassed verges where an increase in traffic is likely to increase verge erosion and associated sediment load in runoff. Due to the increase in traffic particularly HGVs along this route (see Table 3.2), it is likely the road drainage system in place at Weston Hall Road will need to be improved and/or more regularly maintained.

Significant sediment accumulation was observed in the first ditch (eastern side of road) before it reached the culvert under the road opposite the Dinosaur Park entrance. Any sediment from overland flows contributing to flows in this ditch is likely to be held back by a series of sluices installed (see Drawing MMD-233906-DT-1003 in Appendix B). Sediment within the ditch is likely to be remobilized during or following periods of heavy rainfall when runoff rates and flows are higher. The regular removal of this sediment before it is remobilized would prevent a sudden surge of sediment downstream. Existing treatment also exists downstream of the culvert, including a moat, numerous sluices and several large areas of reeds, all

of which are likely to reduce sediment loads prior to its discharge to the River Wensum. Regular maintenance of the ditch along the eastern side is likely to be sufficient in mitigating any significant effects of sediment ingress. Further details of this are provided in Section 3.8.

The culvert connected to the downstream side of the second ditch (western side) appeared clear during the site visit but close to full capacity (Photo 24 on Drawing R1C093-R1-4913 in Appendix G). The clear water and visible gravel bed provided little evidence of sediment accumulation at the base of the grips (e.g. Photo 32 on Drawing R1C093-R1-4914 in Appendix G). Downstream of the grips the ditch connects to the first ditch (see Photo 37 on Drawing R1C093-R1-4915 in Appendix G) and is likely to provide significant dilution before it discharges to the River Wensum. A lack of space between the road edge and the ditch limits other treatment options.

Any mitigation measures proposed along Weston Hall Road are restricted by ownership and maintenance responsibilities for the ditches receiving road runoff. Ownership was confirmed at the site meeting (1st April 2014) and with NCC Highways. The first ditch (eastern side of road) belongs to and is the responsibility of the owner of the Dinosaur Park, with the grips between the road and the ditch being the responsibility of the highways authority (NCC). NCC Highways confirmed the grips were annually cleared as part of their maintenance regime. The second ditch flowing along the western side of the road, within the Weston Hall fence boundary belongs to and is the responsibility of the owner of Weston Hall, with the grips being the responsibility of NCC. The northern most culvert, under Weston Hall Road opposite the Dinosaur Park entrance (see Drawing MMD-233906-DT-1003 in Appendix B), and the 'new culvert' further south, is owned and maintained by NCC. The culvert connecting the first ditch to the moat is owned by the owners of the Dinosaur Park. The owners of the Dinosaur Park confirmed they had not maintained the first ditch and their culvert for many years and are looking to clear the ditch and make improvements over the next few years. The owners of the Weston Hall estate are due to start renovation works on the estate including water features within the grounds in the near future.

Table 3.2: Adjustments to AADT and HGV traffic flows at Marl Hill Road and Weston Hall Road due to Link Road

Location	AADT 2017			AADT 2032			Number of HGVs 2017			Number of HGVs 2032		
	DM	DS	Difference (% difference)	DM	DS	Difference(% difference)	DM	DS	Difference(% difference)	DM	DS	Difference(% difference)
Without the Link Road												
Weston Hall Road	3383	3490	+107 (+3.2%)	3279	3556	+277 (+8.4%)	66	62	-4 (-6.1%)	92	86	-6 (-6.5%)
Marl Hill Road	1674	3317	+1643 (+98.1%)	3146	5549	+ 2403 (+76.4%)	49	81	+32 (+65.3%)	102	187	+85 (+83.3%)
With the Link Road (adjusted AADT and HGV)												
Weston Hall Road	3432	3571	+139 (+4.05%)	3381	3743	**+362 (+10.71%)**	115	143	+28 (+24.45%)	194	273	**79 (+40.72%)**
Marl Hill Road	1625	3236	+1611 (+99.14)	3044	5362	+2318 (+76.15%)	0	0	-81 (-100%)	0	0	**-187 (-100%)**

Table key: Significant increase in traffic; Significant decrease in traffic

3.8 Mitigation to protect surface water quality

3.8.1 Existing NCC Highway works

NCC has a flexible maintenance regime for existing road drainage systems along roads that drain to the Wensum, where problem drains can be cleaned out more regularly on a risk-assessed basis. NCC's maintenance regime can be considered as mitigation, although this is largely reactive along the more rural roads, only clearing ditches or drains when there is a notable problem.

NCC is working with the Environment Agency to consider ways to reduce sediment ingress within road runoff along roads crossing and discharging to the Wensum over the next 5 years. NCC is supporting the Environment Agency's study of sediment ingress at Lyng (EA 2013) as discussed in Section 3.3 and is working with them to consider drainage options to trap sediment before it reaches the outfall to the Wensum.

There are HGV weight restrictions encompassing the bridges over the River Wensum at the following locations:

- Ringland Road (Grid Ref 614147, 313702);
- Costessey Lane (Grid Ref 617658, 312719); and
- Taverham Lane (Grid Ref 615991, 313704).

NCC is undertaking feasibility studies to consider better ways to enforce these restrictions. Improved enforcement of the weight restrictions are likely to remove the number of HGVs using these routes, reducing the amount of verge erosion, spillage risk and contaminants associated with these vehicles entering the River Wensum. The removal of HGVs along these routes is reflected in the traffic model outputs.

NCC could provide a commuted sum to provide more maintenance where appropriate. It should also be noted that, when drains are cleaned out, NCC are in future planning on recording the presence of silt with a GPS location, thus a long-term, geo-reference database will be developed. This information could be presented to the NE/EA upon request. Once the presence of silt generated from the road can be qualitatively assessed the maintenance regime could be adjusted where necessary.

3.8.2 Mitigation plans for key locations

A meeting with Natural England and the Environment Agency took place on 9th September 2014 to discuss further their final outstanding concern raised in their joint letter dated 27th August 2014 associated with reducing silt ingress along the three main road crossings, At this meeting it was agreed by all parties that the production and implementation of a Mitigation Measures Action Plan (MMAP) would be sufficient to enable the conclusion of 'no adverse effect on site integrity'. The MMAP framework has been agreed with Natural England (email dated 7th October in Appendix A). Mitigation measures to be implemented along Weston Hall Road for inclusion in the MMAP are agreed by all parties (email dated 2nd October from the Environment Agency and 1st October from Natural England) as detailed in the sections below.

A1067 at Attlebridge and Lenwade

There is a commitment from NCC to maintain the existing drainage structures at a certain frequency already identified in the Traffic Asset Management Plan (TAMP). The A1067 Fakenham Road at

Attlebridge and Lenwade are currently cleared out on an annual basis, or in response to a blockage, spillage or flooding event. Adjustments to existing maintenance and monitoring regimes will be adopted to mitigate against the impacts of silt ingress to the River Wensum SAC from runoff from the A1067 as set out in the MMAP.

A road drainage survey has been commissioned along the A1067 at Attlebridge (and The Street) and the A1067 at Lenwade. The survey results will identify location and existing conditions of drainage structures including gullies, pipe work, outfalls and flow routes. These results will be used to inform the MMAP.

Weston Hall Road

In order to address concerns of Natural England and the Environment Agency regarding mitigation proposals involving third party land, discussions were held with representatives of the land owners along Weston Hall Road (owners of Weston Hall Estate and the Dinosaur Park) on 17th June 2014. The mitigation measures discussed have changed and NCC are in the process of approaching land owners again with the proposals set out in this report. Drawing R1C093-R1-4807 is within Weston Hall Estate (located north of culverts under Weston Hall Road) and Drawing R1C093-R1-4808 within the Dinosaur Park land (located south of the two culverts under Weston Hall Road).

Further to the Weston Hall Road site visit on 16th July 2014, myself, Rob Dryden and Adam Thurtle (EA project manager for River Wensum Strategy) discussed the following improvements and maintenance to the Weston Hall Road drainage to prevent any additional silt associated with the increased traffic from entering the River Wensum. The main focus was to avoid putting any new structures within the watercourses in order to maintain continuity upstream e.g. for fish and lamprey migration.

Mitigation measures to be implemented along Weston Hall Road for inclusion in the MMAP are presented on drawings referenced R1C093-R1-4807 and R1C093-R1-4808 in Appendix G. Two aspects have been considered; drainage system betterment and reduction of silt ingress.

Weston Hall Estate

Litter was regularly cleared out of ponds fed by ditches within the Weston Hall Estate. Litter traps (netting beneath fence) alongside the green ditch shown on drawing referenced R1C093-R1-4807 were considered ineffective and should be reinstated and maintained by NCC.

The green ditch running parallel to Weston Hall Road on drawing referenced R1C093-R1-4807 is quite small and has a reasonable gradient. As a result, fine sediment (sand, silt and clay) is transported through the system leaving a relatively clean gravel bed. This section is likely to be of ecological value. It was agreed that putting any structure here would adversely affect the longitudinal connectivity of the watercourse. In addition, the potential for silt storage/capture is quite limited.

There are two natural silt traps (or sinks) present where the existing channel widens, dissipating flow energy and resulting in deposition of suspended sediment. The proposed measures are to (1) carry out initial and periodic dredging of an existing natural silt trap present as shown on Photo 3.3 below (Area B on Drawing Ref R1C093-R1-4807 attached); and (2) Initial and periodic dredging of an existing natural silt trap present downstream the ditch flows westwards at its northern extent as shown on Photo 3.4 (Area A on Drawing Ref R1C093-R1-4807 attached). Access to these areas is restricted and may need undertaking by the landowner. Periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Photo 3.3: Natural silt trap (Area B)

Photo 3.4: Natural silt trap to the north (Area A)

Dinosaur Park

The proposed mitigation measures within the Dinosaur Park land are presented on drawing referenced R1C093-R1-4808 (Appendix G).

During the site visit on 16th July 2014 it was agreed with the Environment Agency that the planting of reeds immediately upstream of the two culverts under Weston Hall Road was considered ineffective as the overshadow of the trees would make it difficult to establish good growth. In addition, the alder woodland is of existing conservation interest and therefore should not be felled to make way for reed.

The proposed measures include the removal of existing wooden sluice upstream of the western culvert under Weston Hall Road as it appears to serve no purpose. The culvert removal would need to be preceded by silt removal in a short section of the ditch upstream of the culvert in order to prevent a pulse of sediment passing downstream. The long term measures in this area is to dredge and continue to maintain small intermittent sections along this ditch to act as online silt traps, marked as approximate Areas C-E on Drawing ref R1C093-R1-4808 (Appendix G). It was agreed that there was little benefit in comprehensive desilting of this watercourse since this would have the consequence of improving the transport of sediment downstream to the River Wensum, the very thing we are trying to avoid. Tree cover and vegetation to remain in undisturbed sections to continue to act as a silt trap. Periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Consideration of silt disposal will be given where the invasive Himalayan Balsam (and seeds) is present.

We looked at the potential for local storage of water/silt in the seasonal ditch system on the east side of the road just upstream of southern culvert to capture and divert flows coming down the hill from the south before it enters the ditches being considered for improvements. A small section of ditch remains dry on the eastern side of the road due to the diversion of previous ditch and installation of the southern culvert, marked as a potential 'New Soakaway' on Drawing ref R1C093-R1-4808 (Appendix G). The dry ditch in this location could act as a soakaway with new grips directing flows from the south into here reducing volume of

runoff and associated silt reaching the ditches downstream. Some hedge and tree clearance may be required and construction of new grips through highway verge.

Measures proposed within the Dinosaur Park land could be maintained by NCC maintenance team.

How each area is managed and maintained will be set out in the Mitigation Measures Action Plan, including the consideration of protected species and measures to prevent silt being transported downstream during dredging works.

Mitigation Measures Action Plan

The MMAP will consist of the following:

- Describe the baseline conditions of drainage structures along the relevant road sections, including plans. Baseline conditions will define the location of existing gullies and pipe work, direction of flow, outfall locations and receiving structures (where possible and relevant). Current levels of silt accumulation will be described if identified during the road drainage survey or on site observations. Existing system performance will be discussed, including visual observations of any evidence of verge tracking.
- How the drainage systems will be physically improved along Weston Hall Road prior to the monitoring and maintenance proposed. Physical improvements along A1067 will also be presented if survey results suggest this is required. Plans will be provided to show location of proposed works.
- Tables will be populated once the survey results are received to set out what drainage features are present, who will maintain these, frequency and timing of maintenance, and funding required
- There will be a standard reporting process on monitoring results and maintenance works which will be standardised using a pre-set form provided in this report. This can be used as evidence of compliance to the plan objectives, and to compare results throughout the year and pre and post NDR conditions.
- It will define what would trigger the need for a change in maintenance regime (e.g. increase frequency of clearance if high volume of silt removed for gullies), and any further physical improvements to the drainage systems (e.g. SuDS improvements) and who would deliver these.

Summary

The betterment and preferred silt reduction measures identified above are considered sufficient to further treat any additional sediment generated by increased verge erosion as a result of increased traffic along Weston Hall Road.

NCC is in the process of discussing these measures with the relevant land owners. The legal agreements to secure this are currently being drawn up. It should also be noted that NCC would have statutory power under s100 Highways Act 1980 to put in drainage in land adjoining a highway so as to drain surface water from the highway, if required. The power includes the right to maintain the drain in question, and to connect the drain to any "*inland waters, whether natural or artificial…*". The power would not provide the right to maintain the ponds but it would allow discharge into them. The owner of the land would be entitled to compensation for the exercise of such powers.

To ensure the conclusion of 'no adverse effect on site integrity' the DCO requirement 25 states:

(1) No part of each of work numbers 1 to 24 may commence until a mitigation measures action plan (MMAP) for the A1067 at Attlebridge and Lenwade, and for Weston Hall Road, has been submitted to and,

following consultation with Natural England and the Environment Agency, approved by the relevant planning authority.

(2) The MMAP must include measures for the prevention of sediment entering the River Wensum special area of conservation (as defined in regulation 3(1) of the Conservation of Habitats and Species Regulations 2010) and for monitoring their effectiveness.

(3) The approved MMAP must be implemented in full.

4. Groundwater levels and protection

4.1 Stage 1 screening matrix

During the meeting on 15th January 2014, Natural England identified inconsistencies between the explanatory text in Section C.2 and Stage 1 screening matrix presented in Table 3.1 'Stage 1 Matrix A: River Wensum SAC (Table C.1 equivalent). As described in Paragraph C.2.2 and C.2.4 of the DCO HRA, it is agreed that due to the hydraulic connectivity between surface water and groundwater in the River Wensum, changes in groundwater levels could affect the rooting zone of submerged and floating macrophytes, functionality of spawning by brook lamprey, bullhead and other fish species.

Additional ticks have been added to the 'Change in groundwater levels' section to reflect this as presented again in Table 4.1 and Table 4.2 below.

The conclusions within the DCO HRA relating to the potential impact of the NDR on changes in groundwater levels remain unchanged; the NDR will not intercept groundwater flow or significantly reduce groundwater recharge that may indirectly affect surface water levels and flows. As concluded in Paragraphs E.2.2 and E.2.4 and Table E.1 of the DCO HRA, the NDR will therefore not adversely affect the relevant SAC site features due to changing groundwater levels or surface water flow.

Table 4.1: Presence/absence of qualifying features (revised Table B.20 of the DCO HRA)

Qualifying features	Change in groundwater levels	Change in water chemistry	Change in water flow	Siltation
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation[a]	✓	✓	✓	✓
White-clawed crayfish[b]	✓	✓	✓	✓
Bullhead[c]	✓	✓	✓	✓
Brook Lamprey[d]	✓	✓	✓	✓
Desmoulin's whorl snail[e]	✓	✓	✓	

Source: a) Hatton-Ellis & Grieve, 2003; b) Holdich, 2003; c) Tomlinson & Perrow, 2003; d) Maitland, 2003; e) Killeen & Moorkens, 2003.

Table 4.2: Revised 'Stage 1 Matrix A: River Wensum SAC' (previously Table 3.1 in DCO HRA)

Name of European site: River Wensum SAC												
Distance to NSIP 0.215 km												
European site features	**Likely Effects of NSIP**											
	Change in groundwater levels			**Change in water chemistry**			**Change in water flow**			**Siltation**		
	C	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	✓c	✓c	n/a	✓b	✓b	n/a	✓c	✓c	n/a	✓d	✓d	n/a
White-clawed Crayfish	✓c	✓c	n/a	✓b	✓b	n/a	✓c	✓c	n/a	✓d	✓d	n/a
Bullhead	✓c	✓c	n/a	✓b	✓b	n/a	✓c	✓c	n/a	✓d	✓d	n/a
Brook Lamprey	✓c	✓c	n/a	✓b	✓b	n/a	✓c	✓c	n/a	✓d	✓d	n/a
Desmoulin's Whorl Snail	✓a	✓a	n/a	✓b	✓b	n/a	✓c	✓c	n/a	✓d	✓d	n/a
European site features	**Likely Effects of NSIP**											
	Noise and vibration			**Artificial light and shade**			**Loss of channel habitat**			**Removal of riparian vegetation**		
	C	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	n/a	n/a	n/a	Xf	Xf	n/a	Xg	Xg	n/a	Xh	Xh	n/a
White-clawed Crayfish	Xe	Xe	n/a	Xf	Xf	n/a	Xg	Xg	n/a	Xh	Xh	n/a
Bullhead	Xe	Xe	n/a	Xf	Xf	n/a	Xg	Xg	n/a	Xh	Xh	n/a
Brook Lamprey	Xe	Xe	n/a	Xf	Xf	n/a	Xg	Xg	n/a	Xh	Xh	n/a
Desmoulin's Whorl Snail	Xe	Xe	n/a	Xf	Xf	n/a	Xg	Xg	n/a	Xh	Xh	n/a

Matrix Key: ✓ = Likely significant effect cannot be excluded; X = Likely significant effect can be excluded. Where effects are not applicable to a particular feature they are greyed out; C = construction; O = operation; D = decommissioning.

c = All of the European site features considered to be present within the zone of influence and are sensitive to changes in water flow (Hatton-Ellis & Grieve, 2003; Holdich, 2003; Tomlinson & Perrow, 2003; Maitland, 2003; Killeen & Moorkens, 2003).

4.2 Groundwater risk assessment

At the meeting on 15th January 2014 and in their letter of response to the DCO HRA, the Environment Agency raised concerns regarding the potential risk to groundwater from unlined swales proposed as a first step for the conveyance and treatment of road runoff. The letter from the Environment Agency states the following:

"*The proposed drainage outlined…refers to the use of unlined swales, which would allow infiltration to occur. Although we are satisfied that the HRA has shown no adverse impact on the SAC via groundwater…, our position is that swales used across the NDR should be lined in all but low environmental sensitive location. We have previously highlighted the need for three treatment steps to be employed to protect groundwater (and surface waters) along the route. Allowing infiltration via unlined swales would result in subsequent treatment train components being by-passed, and would make pollution from accidental spills much harder to contain. It should be clearly demonstrated as part of the application that the proposed drainage scheme will appropriately protect both surface and groundwater quality*."

This section considers the Environment Agency's concerns, assesses the risk of accidental spillage and routine road run-off to groundwater (and surface water where applicable) through infiltration in unlined swales up to chainage 1650m (near Fir Covert Road roundabout). This section considers whether the lining of swales in drainage catchments CA1 or CA2 is necessary to prevent any significant adverse effects on groundwater flowing to the River Wensum.

Based on the sensitivity of the receiving watercourses or aquifer, the requirements set out by the Environment Agency and suggested best practice in the SuDS Manual (CIRIA 2006), a three tiered treatment system was applied comprising draining along grassed swales (unlined) to a primary lined lagoon, with discharge via a final infiltration lagoon (unlined) (Lagoon 1).

The drainage catchments and reference numbers within the first 1650m of the NDR are shown on Drawing No. MMD-233906-DT-0981 (Appendix C). The location of swales within these drainage catchments are shown on Drawing No. MMD-233906-DT-0815 (Appendix C).

4.2.1 Risk of accidental spillage

The potential risk of accidental spillage on groundwater and surface water, and the need for pollution control measures in drainage catchments CA1 and CA2, has already been assessed in Paragraphs D.2.31 to D.2.33 and Figure G.2 (Appendix 4) of the DCO HRA. The pollution risk was estimated assuming the drainage system included no measures to mitigate risk i.e. the swales were not lined. For both catchments the risk of spillage to surface water and groundwater is well below the maximum acceptable annual probability (<0.005 for areas where spillage could affect a protected area). The need to provide pollution control measures (swale lining) should be based on an assessment of the probability of an accidental spill occurring. The results from the spillage risk assessment show an extremely low probability of an accidental spill occurring. As a result, no additional measures are considered necessary in the design i.e. the swales would not be lined.

In this context, it is noted that unlined swales are considered to provide a risk reduction factor for spillage of about 40% (see Table 8.1 in HD 45/09). Therefore the risk to groundwater (or surface water) from accidental spillage is reduced further by the presence of an unlined swale.

4.2.2 Risk to groundwater from routine runoff

According to Table 3.2 of the Highways Agency HA103/06: Vegetated Drainage Systems for Highway Runoff (DMRB, Volume 4, Section 2, Part 1) grassed swales (similar to 'filter drains' as

stated in the table) have the potential to remove certain contaminants before infiltration or the conveyance of the runoff to the next treatment step. As an initial form of treatment, grassed swales can remove up to 7% of metals, 52% of PAHs and 38% of total suspended solids through filtration and adsorption. However, during major rainfall events, infiltration to the unsaturated zone and the treatment capacity of the unlined swale are likely to be limited due to high flows. As a result, a larger proportion of contaminants would be treated in the primary (lined) or final lagoon structures.

The potential operational impact of routine road runoff on groundwater and the potential for any contaminants to reach the River Wensum via groundwater was considered in Paragraphs D.2.24 and D.2.30.

The groundwater risk assessment methodology in the Highways Agency (HA) guidance in the Design Manual for Roads and Bridges (DMRB) Volume 11, section 3, Part 10 (HD 45/09): Road Drainage and the Water Environment (hereafter referred to as HD45/09) was used to assess the risk to groundwater from routine runoff at the infiltrating 'Lagoon 1' (third treatment step) but did not consider the impact of infiltration from runoff through the unlined swales (the initial treatment step). This risk assessment process has been used again to assess the potential risk of infiltration from runoff to groundwater (and surface waters) through the unlined swales.

The groundwater risk assessment considers eight parameters which influence the pollutant loading carried by routine road runoff, and the extent to which passage through soil to groundwater may modify the polluting potential of the runoff. These include parameters relating to the source (Annual Average Daily Traffic, annual average rainfall and rainfall intensity) and the pathway function (soakaway geometry, the depth of the unsaturated zone, flow type, effective grain size and lithology). Professional judgement is then applied at the impact assessment stage taking into account any additional factors such as the presence of source protection zones (SPZs).

The risk assessment was undertaken for CA1 in which infiltration via swales could occur as an initial treatment step, with no pre-treatment in place. The risk assessment matrix is presented in Figure C.3 (Appendix C). The risk to groundwater is considered 'medium' (score >150 <200) in this catchment.

4.2.3 Impact assessment and further mitigation

The potential for infiltration through the proposed swale in drainage catchment CA1 (draining to Lagoon 1) to cause a significant adverse effect on groundwater was determined using the impact assessment process (Chapter 5, HD45/09), with the assumption that the swale is unlined and using a source-pathway-receptor approach. The assessment process considered the groundwater feature, the attributes (e.g. springs & discharge to surface water, water supply), the importance of the feature (based on rarity and quality) and the potential magnitude of impact based on the groundwater and spillage risk assessment scores for each drainage catchment. The overall significance of effect was then based on the assessment of the importance and magnitude of impact. The location of environmentally sensitive receptors or zones has been considered as part of this process.

Drainage catchment CA2 also drains to Lagoon 1 however impermeable kerbs and gullies are proposed along this stretch therefore the groundwater risk assessment is not applicable.

The impact assessment results are presented in Table C.2 in Appendix C.

The overall significance of effect on the Principal aquifer (Chalk) from infiltration of routine runoff to groundwater in CA1 is considered slight adverse due to the shallow Chalk in small sections of the swale length (see Table C.2 in Appendix C). Lining is therefore proposed within this catchment. This is supported by the Environment Agency's letter of response to Revision A of the Addendum to

the HRA (dated 23rd May 2014), where they requested that the swales in Drainage Network CA1 *are* lined, in order to further reduce risk to the groundwater-fed River Wensum and adopting a more precautionary approach.

The presence of kerbs and gullies in drainage catchment CA2, with no treatment via grass swales, results in only two treatment steps prior to discharge to ground. To address the Environment Agency's concerns regarding the need for three treatment steps prior to Lagoon 1 (due to the presence of Chalk directly below the infiltration lagoon), a revised drainage strategy has been considered:

Option 1: Replace the kerbs and gullies serving the eastbound carriageway with a lined filter drain. This would provide the additional treatment step for the eastbound carriageway. However, the bitumen channel cannot be changed to a grassed swale or filter drain due to safety restrictions associated with maintenance of the central reserve, therefore only two treatment steps would remain for the westbound carriageway.

The replacement of kerbs and gullies for a filter drain and the need to move the spreader ditch to the north capturing overland flow would be considered as new; therefore this change would need to be registered as a design change dealing with a statutory enquiry.

Option 2: Retain the kerbs and gullies and bitumen channel as suitable impermeable structures and include another treatment step prior to the primary lagoon.

A lined gravel filled trench was accepted by the EA at Postwick as an additional treatment step within the SPZ1 where groundwater protection was stricter. Similarly, a new, lined filter drain could be incorporated prior to the primary lined lagoon.

It is considered that Option 2 should be taken forward, with an additional treatment step being incorporated within Drainage Network 1 (CA2), consisting of a lined filter drain prior to the primary lined lagoon. Swales within catchments CA1 will also be lined. The revised design is shown on Drawing R1C093-R1-4951 in Appendix C.

4.3 Drainage design

The proposed drainage design between chainage 390m and 780m on the southern side of the NDR was not mentioned in the DCO HRA (Paragraphs D.2.20). The southern carriageway between chainage 390m to approx. 780m drains to kerbs and gullies and flows into Lagoon 1 as shown on Drawings MMD-233906-DT-0815 and R1C093-R1-4951 (Appendix C). As detailed in the above sections, the swales will be lined and a gravel trench included in the design prior to the primary lined lagoon to create an additional step within the treatment train.

5. Flood risk

5.1 Temporary ditch during construction

The DCO HRA considered the potential impacts of construction on the River Wensum SAC. In Paragraphs D.2.6 to D.2.12 the HRA considers the potential impact of highly turbid surface waters leaving the construction site and entering the River. It is explained that "*Temporary drainage arrangements (ditches) would be installed as appropriate to manage run-off from the working area*" and that "*all surface water run-off from this part of the site would be directed (through temporary drainage arrangements) into the low lying area away from the River Wensum and the golf course. In this way no run-off from the site would be able to gain direct access to the flood plain*".

In the Environment Agency's letter of response (Appendix A), the Environment Agency have sought further clarification on how temporary ditches will be built to accommodate surface water run-off from topsoil and hard surfaces during construction and how they would prevent discharge of silt laden water to the River Wensum. Further design details are required including calculations to demonstrate that the ditch would be sufficient to deal with the quantities of run-off generated by winter/summer storms.

The temporary ditch proposed along the southern side of A1067 Fakenham Road and the construction footprint draining to this ditch are shown on Drawing No. R1C093-R1-4399 (Appendix D). The ditch would be located between where the NDR connects with the A1067 and channelled approximately 900m in an easterly direction only the A1067. This would provide a barrier between the construction footprint and the River Wensum and nearby golf course.

A cross-section of the ditch showing its proposed dimensions is shown on Drawing No. R1C093-R1-4399A (Appendix D). The bed of the ditch would be approx. 0.5m wide and 0.5m deep, with 1:1 slopes. An earth bund (using the material excavated from the ditch) is to be provided along the southern side of the ditch, along its full length and approx. 0.5m high. The ditch itself has been designed to cope with a 1 in 10yr storm event based on the MicroDrainage results provided in Appendix D. However, the bund provides further protection and storage. The ditch bed elevation would be adjusted to allow water to flow and concentrate away from the closed ends of the bund, to prevent runoff flowing around the ends of the bund and entering the river or golf course.

Based on the provision of this temporary ditch, the original conclusion remains unchanged: that an adverse impact (attributable to the NDR) on the integrity of the River Wensum SAC resulting from changes in water chemistry and increased siltation in the River Wensum following the generation of highly turbid surface water is not reasonably foreseeable during construction of the NDR.

5.2 Lining of swales

As described in section 4 above, the potential risk to groundwater from routine runoff infiltrating through unlined swales within the first 1500m is considered slight to moderate adverse (significant), therefore it was concluded that the swale is drainage catchment CA1 will require lining to provide further protection to groundwater.

The impact of the NDR on flood risk in this section still remains unchanged, as identified in the Flood Risk Assessment (Volume 2, Chapter 21 (Document Ref 6.2)) and summarised in Chapter 14 of Volume 1, as the swales were modelled as impermeable structures (no infiltration).

6. Revised Stage 2 outcomes

6.1 Screening matrix

As presented previously in paragraphs E.1.1 to E.1.3 the detailed assessments and clarifications provided in this report have been used to establish if the proposed Scheme could have an adverse effect on their integrity. Evidence for the conclusions reached on integrity is presented in section 6.2 or in previous sections where referenced.

Matrix Key:

✓ = Adverse effect on integrity cannot be excluded

X = Adverse effect on integrity can be excluded

C = construction

O = operation

D = decommissioning

Where effects are not applicable to a particular feature the matrix cell is greyed out. As amended in Table 4.2, cells are no longer greyed out for 'changes in groundwater levels' against submerged and floating macrophytes, functionality of spawning by brook lamprey, bullhead and other fish species, as groundwater can affect 'changes in water flow'.

Table 6.1: Stage 2 Matrix 1: River Wensum SAC (Revision to Table E.1 p.65-66 of the DCO HRA)

Name of European site: River Wensum SAC															
Distance to NSIP 0.215 km															
European site features	Adverse effect on integrity														
	Change in groundwater levels			Change in water chemistry			Change in water flow			Siltation			In combination		
	C	O	D	C	O	D	C	O	D	C	O	D	C	O	D
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	**Xc**	**Xc**	n/a	Xb	Xb	n/a	Xc	Xc	n/a	Xd	Xd	n/a	Xe	Xe	n/a
White-clawed Crayfish	**Xc**	**Xc**	n/a	Xb	Xb	n/a	Xc	Xc	n/a	Xd	Xd	n/a	Xe	Xe	n/a
Bullhead	**Xc**	**Xc**	n/a	Xb	Xb	n/a	Xc	Xc	n/a	Xd	Xd	n/a	Xe	Xe	n/a
Brook Lamprey	**Xc**	**Xc**	n/a	Xb	Xb	n/a	Xc	Xc	n/a	Xd	Xd	n/a	Xe	Xe	n/a
Desmoulin's Whorl Snail	Xa	Xa	n/a	Xb	Xb	n/a	Xc	Xc	n/a	Xd	Xd	n/a	Xe	Xe	n/a

6.2 Screening matrix evidence to support conclusions

The overall conclusions as to whether the proposed scheme will adversely affect the integrity of the River Wensum SAC remain unchanged. However, the conclusions are further supported by the results of the assessments undertaken in this addendum report. Additional text has been added to support the relevant conclusions below where relevant.

Decommissioning has not been considered as explained in Paragraph E.2.1 of the DCO HRA.

a. European site feature (Desmoulin's whorl snail) is considered to be present within the zone of influence (see Section 3.4) and is sensitive to changes in groundwater levels (Killeen & Moorkens, 2003). Adverse effect on site integrity can be excluded because:

- Refer to conclusions in Paragraph E.2.2 of DCO HRA (remain unchanged).

b. All of the European site features are considered to be present within the zone of influence (see Section 3.4) and are sensitive to changes in water chemistry (Hatton-Ellis & Grieve, 2003; Holdich, 2003; Tomlinson & Perrow, 2003; Maitland, 2003; Killeen & Moorkens, 2003). Adverse effect on site integrity can be excluded because:

- Refer to conclusions in Paragraph E.2.3 of DCO HRA (remain unchanged).
- Furthermore, the hydrological pathway for potentially contaminated and/or sediment laden surface water to move from the NDR to the River Wensum remains negligible (limited/short duration input if any) with the additional measure to construct a temporary ditch to prevent sediment laden water during storm events from reaching the River Wensum (see Section 5.1); and
- Furthermore, the hydrological pathway for potentially contaminated and/or sediment laden surface water to move from the NDR to the River Wensum remains negligible with the implementation of lined swales within drainage catchment CA1 and the provision of an additional treatment step prior to the primary lagoon of Lagoon 1 (see Section 4.2.3).

c. All of the European site features are considered to be present within the zone of influence (see Section 3.4) and are sensitive to changes in water flow (Hatton-Ellis & Grieve, 2003; Holdich, 2003; Tomlinson & Perrow, 2003; Maitland, 2003; Killeen & Moorkens, 2003). Adverse effect on site integrity can be excluded because:

- Refer to conclusions in Paragraph E.2.4 of DCO HRA (remain unchanged).

d. All European site features (except Desmoulin's whorl snail) are considered to be present within the zone of influence (see Section 3.4) and are sensitive to siltation (Hatton-Ellis & Grieve, 2003; Holdich, 2003; Tomlinson & Perrow, 2003; Maitland, 2003). Adverse effect on site integrity can be excluded because:

- Refer to conclusions in Paragraph E.2.5 of DCO HRA (remain unchanged).
- Furthermore, the hydrological pathway for potentially contaminated and/or sediment laden surface water to move from the NDR to the River Wensum remains negligible (limited/short duration input if

any) with the additional measure to construct a temporary ditch to prevent sediment laden water during storm events from reaching the River Wensum (see Section 5.1); and

- Furthermore, the hydrological pathway for potentially contaminated and/or sediment laden surface water to move from the NDR to the River Wensum remains negligible with the implementation of lined swales within drainage catchment CA1 and the provision of an additional treatment step prior to the primary lagoon of Lagoon 1 (see Section 4.2.3).

e. The projected major reduction of traffic on nearby roads with a direct link with the River Wensum would be strongly beneficial compared to the do minimum scenario. The reduction in AADT will reduce contaminant loads, risks of spillages and, most importantly in relation to sediment generation, the potential erosion of road verges.

- This conclusion is further supported by the results of the impact assessment of sediment ingress to the River Wensum (see Section 3.7). The proposed scheme has a beneficial effect on sediment ingress to the River Wensum SAC by reducing traffic density on four roads crossing and draining to the river, where verge erosion is or could be an issue;

- Furthermore, the risk to surface water quality in the Wensum from routine runoff and accidental spillage as a result of increased traffic on the A1067 Fakenham Road is considered acceptable, having a negligible impact on the integrity of the SAC based on the implementation of an improved maintenance regime (see Section 3.7 and 3.8); and

- The potential cumulative effects of the NDR with the new link road between the A47 and A1067 is considered negligible with more frequent maintenance of drainage ditches (sediment removal) and the installation of new sediment traps within ditches receiving road runoff from Weston Hall Road and draining to the River Wensum. (see Section 3.8).

7. References

APEM (2013) Evaluation of Road Crossing Points in the Wensum and Norfolk Rivers Catchment, Natural England. APEM Scientific Report 412442

APEM (2010) Rural Sediment Tracing Project – National Summary Report. APEM Scientific Report 410987

Environment Agency, 2013. Impact of Highways Drainage from Rural Roads, Lyng, Norfolk. Report version 2 July 2013 (Draft)

Evans, R. (2011) A Rapid Assessment of Sediment Sources on the Wensum above Norwich, with particular emphasis on road crossings. 57 pp

Collins, A., 2011. Wensum sediment fingerprinting investigations. Presentation, Wensum Sediment Fingerprinting Investigations Seminar, UEA, Norwich, 12 July 2011.

Coombes, M., Curini, A., Howard Keeble, A., Green, T. and Soar, P. 1999. River Wensum Restoration Strategy. Natural England Research Reports, Number 024

Sear, D., Newson, M., Old, J. and Hill, C. (GeoData, University of Southampton). 2006. Geomorphological appraisal of the River Wensum Special Area of Conservation, English Nature Research Report No. 685.

Appendices

Appendix A. Consultation

Table A.1: Further consultation with Natural England, Environment Agency and Norfolk Wildlife Trust

Date	Response format	Main comments
May 2014	Draft HRA Addendum (Rev A) submitted for EA/NE comment (email)	Report created in response to concerns raised by EA and Natural England on the DCO HRA.
23rd May 2014	EA letter of response to draft HRA Addendum (Rev A)	Concerns associated with surface water quality, groundwater levels and protection, and flood risk.
2nd June 2014	NE letter of response to draft HRA Addendum (Rev A)	Concerns associated with surface water quality resulting from increased traffic along the A1067 and Weston Hall Road.
10th June 2014	Internal meeting with NCC NDR design team, contractor (Birse), MM environmentalists and NCC highways maintenance team.	Discuss the need and possibilities of lining swales in the drainage catchments CA1 and CA2 in terms of design, construction and maintenance. Discussions of existing conditions of drainage features along A1067 at Attlebridge and Lenwade, and along Weston Hall Road – drainage system improvements and/or improved maintenance.
17th July 2014	Draft HRA Addendum (Rev B) submitted for EA/NE comment (email)	A second version of the report submitted for comment in response to EA and NE formal responses to report Rev A.
27th August 2014	EA/NE letter of response to draft HRA Addendum (Rev B)	Set out suggested proposed mitigation measures to address silt inputs to the Wensum at A1067 at Attlebridge and Lenwade and along Weston Hall Road. Considers it appropriate for the HRA to include a Mitigation Measures Action Plan, preferably be in tabulated form, and set out the detail of the proposed mitigation at each site (e.g. action, timing/frequency, funding source, responsibility for implementation).
9th Sept 2014	Meeting with EA and NE	Discussed and addressed concerns set out in formal EA/NE letter of response dated 27th August 2014. All parties agreed the production of a Mitigation Measures Action Plan would best to set out, agree and commit to the improvement measures proposed along Weston Hall Road and the A1067 at Attlebridge and Lenwade.
11th Sept 2014	Teleconference with EA	Covering meeting discussions from 9th Sept. Advice sought on silt trap measures in existing ditches along Weston Hall Road. Site visit arranged to finalise acceptable proposed measures.
16th Sept 2014	Site visit with EA – Weston Hall Road	Onsite discussions with EA for options of betterment and silt reduction measures along Weston Hall Road.
30th Sept 2014	Email to NE and EA - Weston Hall Road drainage improvement measures	Presenting preferred options for betterment and silt reduction measures along Weston Hall Road, including draft plans (Drawing No. R1C093-R1-4807 and 4808). Requested confirmation of whether measures acceptable.
1st Oct 2014	Email from Natural England - Weston Hall Road drainage improvement measures	Deferred responsibility to EA to have final say on proposed measures along Weston Hall Road.
1st Oct 2014	Email to Norfolk Wildlife Trust - Weston Hall Road drainage improvement measures	Presenting preferred options for betterment and silt reduction measures along Weston Hall Road, including draft plans (Drawing No. R1C093-R1-4807 and 4808). Requested confirmation of whether measures acceptable based on potential impact to Weston Meadows CWS.
3rd Oct 2014	Email response from Norfolk Wildlife Trust in response to email	No concerns, in principle, regarding the drainage improvement works. Requested that working practices are such that damage to the adjacent areas of the CWS is kept to a minimum.

	dated 1st Oct	
2nd Oct 2014	Email – Environment Agency	EA agree with proposed measures. They should help reduce the volume of silt that is entering the Wensum from the road. This will help mitigate for any increase in the supply of sediment and other pollutants as a result of predicted traffic increases that would result from construction of the proposed Norwich Northern Distributor Road. Further offline measures may be required if maintenance and monitoring proposed within a Mitigation Measures Action Plan (MMAP)
7th Oct 2014	Two emails from Natural England regarding draft MMAP framework	NE in agreement with draft MMAP framework headings and proposed content. Details of other 3rd landowners involved will need to be included in Appendix C, at least in outline.
9th Oct 2014	Email – Natural England	Natural England anticipates being able to advise 'no adverse effect on site integrity' when PINS consults on the Report on Impact on European Sites (RIES) on 17th October.

Record of meeting/discussion

Mott MacDonald

Project title	Norwich Northern Distributor Road (NDR)	**Division**	BNI
Subject	Statement of Common Ground, HRA	**Project no**	233906
Location	Dragonfly House	**Date of meeting**	15/01/2014

Present	Louise Oliver	LO		Natural England
	Martin Barrell	MB		Environment Agency
	Jon Barnard	JB	NDR Team Manager	Norfolk County Council
	Marcin Kurek	MK	Project Engineer	Norfolk County Council
	Laura Henderson	LH	Principal Ecologist	Mott MacDonald
	Jacqueline Fookes	JF	Environmental Scientist	Mott MacDonald
	Simon Allen	SA	Environmental Scientist	Mott MacDonald
	Jonathan Nichols	JN	Environmental Scientist	Mott MacDonald

Recorded by	**Distribution**
JN	All attendees

Item		**Text**	**Action on**
1	JB	NDR project update: DCO application submitted; PINS 28days for validation (non-technical) followed by 6 months examination in public; letters issued to local councils, statutory bodies, interested parties and opposition.	-
2	-	Statement of Common Ground (SoCG)	-
	JB	SoCG will save time and money in examination in public and therefore needs to be concise and not duplicating information already presented elsewhere.	-
	MB	Suggests presenting SoCG using matrices: what is agreed between parties, what is disagreed, what is irrelevant, etc; needs to be as concise as possible containing the least content which can be challenged in public.	-
		Action: circulate example to attendees.	**MB**
	All	Further discussion about SoCG formats: textual list of what parties agree/disagree on; separate SoCGs, one for EA and another for Natural England; agreed will resolve format as process goes forth, and begin by assuming single SoCG will involve both EA and NE together.	-
	JB	Need SoCG to be in place prior to initial examination meeting with inspector during April, therefore need SoCG by mid-March.	-
	JB	Postwick out of SoCG scope assuming there are no legal challenges.	-

Record of meeting/discussion
Continuation sheet

Mott MacDonald

Project No. 233906 **Date of Meeting** 15/01/2014

Item		Text	Action on
		Action: circulate NSIP programme so can see stages of process.	**JB**
	MK	Question: when will the SPZ boundary at Postwick be defined?	-
	MB	Answer: SPZ boundary at Postwick not yet defined by EA are happy with the current proposals in principle and only the detail has yet to be resolved.	-
	JB	Question: are the planning and licensing sections of Natural England integrated or do they operate in separate silos? Concern about the appearance that NDR interests may appear to be having too much of an influence of licensing which may come up at the public enquiry.	-
	LO	Answer: responsibilities of planning and licensing are separate therefore there can be no accusations of unfair influence.	-
	SA	Question: if planning and licensing are operating independently, how will the SoCG tie-up with licensing/regulation?	-
	LO	Answer: A letter of comfort will be issued.	-
	All	Agreed will populate SoCG as a matrix via email and meet at a future date.	-
3	-	Habitat Regulations Assessment (HRA) review: overall comments	-
	SA	Note: the draft HRA originally submitted for comment has been revised, and appendices appended for submission as part of the NDR DCO application. Copies were given to LO and MB.	-
	LO	Overall comments on HRA: is a very detailed assessment, but needs to be more robust with more description; requires greater expansion as to why certain impacts can be discounted and what the evidence base is that supports the view that there will be no impact; the HRA needs to be as water tight as possible to prevent other interested parties picking holes in it.	-
4	-	Habitat Regulations Assessment (HRA) review: silt ingress	-
	LO	Specific issue regarding sediment ingress to the Wensum: it is recognised there is already significant runoff from agricultural land giving rise to the unfavourable condition of riverine ecosystems. It is difficult to trace the source of sediment between road verges and agricultural ditches. Therefore there is a question over the extent to which the impact of the NDR on silt runoff from minor roads can be discounted, especially because the figures presented are not clear in their support of this conclusion (e.g. adding in overall/aggregate silt figures would be helpful).	

Item		Text	Action on
	MB	The text also unfairly suggests that where no direct link can be determined between NDR-related traffic and increased sedimentation the potential cause can be discounted. But there is a possibility of indirect causation and this is not considered in the HRA. This therefore needs to be included or explained.	
	JF	Ecosystem Services Assessment (ESA) produced by Cranfield University shows NDR will overall have a beneficial effect on sedimentation reducing silt ingress by breaking up existing road-drainage catchments through bunding and non-surface drainage systems, etc.	
	JB	On some minor roads outside the NDR yes there is an increase in sediment loading, but on other roads there is a decrease: the aggregate sediment loading is predicted to be the same as that of the existing situation (or do-minimum scenario) overall. Furthermore, other non-NDR schemes to improve peripheral roads e.g. Ringland Hills will combine to reduce silt ingress in the area.	
	LO	In which case there needs to be more detail in the HRA document referring to ESA and Traffic Assessment (TA) and table on page 57 needs to show aggregate figures for all roads. The non-NDR road improvements mentioned by JB also need to be included as mitigation. Furthermore, it should be evident that the precautionary principle has been applied (this being the Habitat Regs). Overall there needs to be more expansion on how the conclusions have been reached using the evidence available, and this evidence from other areas of the DCO document (e.g. TA, ESA) need to be pulled in to support. More details are needed regarding the drive-by survey: questions over the timing and experience of surveyors – need to state/explain to avoid challenges/criticisms over these issues at examination.	
		Action: in HRA need to present evidence of silt ingress from road verge erosion and that the NDR will not exacerbate this, that non-NDR road schemes operated by the council are working together with the NDR to address the issue.	**JF *et al*.**
	JB	Question: considering the HRA has already been submitted as part of the DCO application, when would be the appropriate time to add in this extra information now it has been published?	
	LO	Answer: as an addendum and info should definitely be ready ahead of the examination in public [?]	
5	-	Habitat Regulations Assessment (HRA) review: changes in groundwater levels	-
	LO	Section called “evidence to support conclusions” in Stage 1 Outcomes and screening matrix where explains how things are	

Item		Text	Action on
		scored – explanatory text contradicts table, therefore need to add more ticks where appropriate. ZOI could also be better defined and explained e.g. through the provision of a map to help explain how will be impacted. Add description of how key off road routes were IDd and why there might be changes. There also needs to be more detail about how temporary drainage ditches would work during construction.	
	MB	Question: would the CEMP be consulted upon?	
	JF	Answer: the CEMP is a living document based on construction requirements outlined in the ES and any planning conditions brought up in the DCO. The CEMP is partly a demonstration that will undertake mitigation promised in ES and as a means of discharging planning conditions. More detail will come in as PINS processes progresses.	
	LO	Question: are contractor's compounds and borrow pits outside of the scheme?	
	JF	Answer: contractors compounds are part of the scheme within the "red line". There are no borrow pits.	
	MB	Question: what are the other consents required in addition to the HRA and where are they presented?	
	JF	Answer: a DCO document [title] lists those that are known. A number listed in the current version of the HRA were discounted as they are not thought to be required.	
6	-	Habitat Regulations Assessment (HRA) review: groundwater protection	-
	MB	Groundwater protection requires 3-stage treatment in drainage design. Swales therefore may need to be lined, although SUDS guidance on this unclear.	
	MK	Approach to drainage was risk-based e.g. SPZ location swales were lined whereas elsewhere where no SPZ swales were not lined.	
	JB	We need to present this approach in our documents, explaining our precautionary default position and explaining deviations from it.	
7	-	Habitat Regulations Assessment (HRA) review: in-combination effects	-
	LO	The discussion in this section is very short and needs to explain in more detail why these impacts can be ruled out.	

Mr Simon Allen - Environmental Scientist
Mott MacDonald
County Hall Martineau Lane
Norwich
Norfolk
NR1 2US

Our ref: AE/2014/117141/01-L01
Your ref: 233906EN/BSE/NOR/018

Date: 23 January 2014

Dear Simon

DRAFT HRA FOR NORWICH NORTHERN DISTRIBUTOR ROAD (NDR)

Thank you for sending through a copy of the draft Habitats Regulation Assessment for the proposed Norwich Northern Distributor Road (ref: 233906EN/BSE/NOR/018; dated November 2013), and for the meeting on 15 January 2014. The meeting was a useful opportunity to go through Environment Agency and Natural England comments on the draft document. The comments raised, and some further minor points, are outlined below:

In summary, we are broadly in agreement with the findings of the draft Assessment. There are a number of points on which we would suggest that clarification or further information is required, and these are set out below.

We would however, as expressed at the meeting, currently question the conclusions with respect to the impacts of sediment ingress from the local road network (section 4.2.2.5 and Table 4.2). This is also further detailed below.

Section 2.1. At this stage we can not confirm that we would be able to adopt the outcomes of this HRA, in respect of any consents that we may be required to issue in connection with the scheme. This is because at this time we do not have full details of all the activities that may require consent, and so are unable to assess their impacts on the River Wensum SAC.

Section 2.3.3 We would suggest that the zone of influence of the NDR on the European interest features should be more precisely defined. When considering this it should be borne in mind that impacts on water quality elements can extend a considerable distance downstream from the point of entry of any pollutants.

Section 2.4.2 Changes in groundwater levels may also impact on in-channel designated features. Changing groundwater levels may influence the connectivity between surface water and groundwater in the hyporheic zone, which can affect the rooting zone of submerged and floating macrophytes, and the functionality of gravels used for spawning by brook lamprey, bullhead and other fish species. For these reasons we would suggest that the assessment of not applicable given in Tables 3.1 and 5.1 need amending to reflect this, as does the sensitivity of qualifying features to potential effects assessment in Table 2.6.

Section 2.4.2.2 As discussed further below, there is potential for the discharge of sediment to the Wensum via surface water run-off from the local road network even where there is no actual direct link to the Wensum. We have observed such discharges in the Ringland area, and there is potential for worsening of such discharges if the NDR increases traffic volumes and verge erosion on these roads.

Section 4.2.1.1 As highlighted in this section, the NDR scheme will not intercept the water table. We agree that the surface area of the impermeable road surface in relation to the catchment size and the surface area of open ground in the vicinity of the western end of the route is unlikely to be significant. As such, the proposal is considered unlikely to significantly affect the groundwater flow. No change in water level is therefore anticipated.

Section 4.2.2.1 In the description of drainage arrangements for NDR, a section from chainage 390m to chainage 780m on the southern side appears to be missing. Is no surface water run-off anticipated on the southern side of the carriageway in that section?

The proposed drainage outlined in this section also refers to the use of unlined swales, which would allow infiltration to occur. Although we are satisfied that the HRA has shown no adverse impact on the SAC via groundwater (see below), our position is that swales used across the NDR should be lined in all but low environmental sensitivity locations. We have previously highlighted the need for three treatment steps to be employed to protect groundwater (and surface waters) along the route. Allowing infiltration via unlined swales would result in the subsequent treatment train components being by-passed, and would make pollution from accidental spills much harder

to contain. It should be clearly demonstrated as part of the application that the proposed drainage scheme will appropriately protect both surface and groundwater quality.

Section 4.2.1.2 It should be clarified how ditches built to accommodate surface water run-off from topsoil and hard surfaces during construction would prevent discharge of silt laden water to the River Wensum. Further details of these temporary drainage arrangements could be provided or referenced (including calculations to demonstrate that they would be sufficient to deal with the quantities of run-off generated by winter/summer storms); or the mechanism to ensure that this issue would be assessed and implemented as part of the scheme could be highlighted in this section.

Section 4.2.2.3 We have not interrogated the HAWRAT model or the input parameter values. However, we note that conservative assumptions have been made during the risk assessment process. Specifically, dilution and attenuation within groundwater have not been modelled as active processes even though they are likely to have a significant impact on any dissolved contaminant concentrations.

Section 4.2.2.5 Whilst some of the roads listed have no direct link to the Wensum, they may be indirectly linked via the surface water drainage network. Alternatively, road run-off could flow down-gradient along the routes to the A1067 and then into the surface water drainage network. Therefore there would appear to be a pathway by which sediment run-off and associated pollutants could adversely impact on the River Wensum. The traffic predictions indicate that volumes will increase on some of these routes (2 routes in 2017 and three routes in 2032). In the absence of mitigation, this is likely to lead to greater verge erosion and so there would appear to be the potential for greater input of silt to the Wensum. Water pollution – agriculture/run-off is listed as one of the reasons for adverse condition of the River Wensum SAC.

Based on the precautionary principle, we cannot therefore currently support the conclusion that the NDR will lead to a reduction in sediment generation from the local road network, as stated in this section and section 4.3.2.2. In order to demonstrate no adverse impact on the integrity of the SAC, further information should be provided in the HRA to clearly demonstrate that overall sediment generation from these routes will not increase as a result of the NDR. If this cannot be shown, it would be advisable for a programme of works to reduce the impacts of diffuse pollution from the local road network to be agreed and implemented in advance of, or in tandem with, the construction of the proposed NDR.

Because of the present uncertainty about these impacts of the scheme it is currently difficult to arrive at a conclusion of no adverse impact on integrity of the Wensum SAC. There would appear to be an opportunity to reduce the risk to the Wensum from local road run-off, and thereby contribute to betterment of the condition of the SAC as part of the environmental mitigation for the proposed NDR, although we note your comments at the meeting regarding the geographical scope of any works that fall within the NDR application.

Please contact me in the first instance if you wish to discuss any aspect of this response in more detail.

Yours sincerely

MR MARTIN BARRELL
Sustainable Places - Planning Specialist

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Date: 5 March 2014
Our ref: DAS/15012014
Your ref: n/a

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BY EMAIL ONLY

Dear Simon

Discretionary Advice Service (Charged Advice)
Contract Reference: DAS/15012014
Development proposal and location: Norwich Northern Distributor Road

Thank you for your consultation on the above.

This advice is being provided as part of Natural England's Discretionary Advice Service. Mott MacDonald on behalf of the applicant, Norfolk County Council, has asked Natural England to provide advice upon:

- the Habitat Regulations Assessment (HRA) for the Norwich Northern Distributor Road (NDR)

This advice is provided in accordance with the Quotation and Agreement dated 15 January 2014.

The following advice is based upon the information within:

1. Habitat Regulations Assessment - draft (233906EN/BSE/NOR/018), dated November 2014;
2. 6.2 Environmental Statement: Volume II: Chapter 17. Habitat Regulations Assessment, dated 8 January 2014; and
3. the discussions between Norfolk County Council, Mott MacDonald, Environment Agency and Natural England during the meeting on 15 January 2014.

Protected sites

The meeting on 15 January 2014 was positive and helpful and I confirm our advice regarding the HRA for the NDR.

Natural England has reviewed the draft appropriate assessment which has been provided by Mott MacDonald and is concerned that reasonable scientific doubts remain as to the absence of adverse effects on the integrity of the River Wensum Special Area of Conservation (SAC) arising from the proposed development. Natural England therefore suggests that further information is provided in order to eliminate these doubts.

The main issue for Natural England, and also the Environment Agency, is that we are unable, at present, to agree that there will be no adverse impact on the integrity of the SAC in relation to

sediment ingress.

Further explanation on Natural England's concerns are provided below, together with some minor comments about the HRA reports reviewed.

Please note I have cross-referenced my comments to both of the above HRA documents. The first set of reference and page numbers in bold type refers to the HRA report submitted to PINS; whilst the second set of reference and page numbers in brackets refers to the draft HRA report.

B.3.25 (p24) (2.3.2 (p8)) I suggest the sentence which begins "This reiterates the advice from a meeting…" is amended as follows "This reiterates the advice from a meeting held on 12 April 2006, where **English Nature, one of Natural England's predecessors,** confirmed that an HRA would be required…SAC/SPA//Ramsar (**English Nature's letter to Norfolk County Council dated 22.02.06).**"

B.3.26 (p25) (2.3.3 (p8)) The Zone of Influence needs to be expanded and more clearly defined, as impacts on water quality and sediment ingress may extend both upstream and downstream of the NDR footprint. It may assist clarity if a map showing this were included in an appendix.

B.4.1 (P25) (2.4.1 (p8)) The Natura 2000 and Ramsar information appears to be missing from the Appendices as there is no Appendix B as stated in the text.

B.4.7 (p26) (2.4.1 (p9)) For clarity it would be useful to state in the text that it is Natural England's assessment that the units are in unfavourable condition.

B.4.8 (p26) (2.4.1 (p9)) For clarity it would be useful to state in the text that the surveys undertaken were commissioned as part of the evidence base for the NDR proposal.

Table B18 (p28) There's a typo in final box of the second column of the table which corrected should read as follows "Riparian land management makes this **stretch** of river unsuitable."

Table B.20. (p30) (Table 2.6 (p11)) Under the column heading 'Change in ground water levels' the boxes for **all** the qualifying features should be ticked, rather than just Desmoulin's whorl snail. As discussed during our meeting there is potential for changes in groundwater levels to influence connectivity between surface water and groundwater where these two meet and interact, which in turn could affect **all** SAC features.

For this reason, this table, **Table 3.1 (p40)** and the **unnumbered table on p65** (Table 5.1on p34 of the draft HRA), together with and any references in the accompanying texts, should be amended to reflect that all features are sensitive to changes in groundwater levels.

Table B18 (p28) There's a typo in final box of the second column of the table which corrected should read as follows "Riparian land management makes this **stretch** of river unsuitable."

B4.14 (p31) (2.4.2.2 (p12)) It would be good to provide further supporting evidence and details about the site visits to support the anecdotal evidence supplied.

B4.16 (p31) (2.4.2.2 (p12)) If the surface and groundwater quality monitoring programmes were undertaken together over the same periods of time, it would be better to use the same text as in B4.24 for consistency.

B4.17 (p31) (2.4.2.2 (p12)) An explanation of how these key-off route roads were identified should be provided.

B4.18 (p32) (2.4.2.2 (p12)) There are a number of points to make about this section:

- Full details of the "drive along" check undertaken should be provided including methodology, experience of the surveyors, and the weather conditions prior to the survey date. Ideally, a survey would be undertaken 24-48 hours after an episode of heavy and sustained rainfall (preferably in winter), in order to identify surface discharges accurately.
- The surface watercourses in this area drain into the Wensum and so are hydrologically connected. So, even where there does not appear to be any direct routes, sediment run-off from roads can enter the river. With increased volumes of traffic identified on some of these key routes, there is potential for more sediment to enter the Wensum due to greater erosion of road verges.
- It would assist understanding if the road names were added to the drawing entitled 'Existing Road Drainage and Sediment Ingress Points' in Appendix 1.
- Note references are made, incorrectly, in the text, to Appendices A and B rather Appendices 1 and 2.

B4.37 (p37) (2.4.2.3 (p16)) The text in this section and the earlier draft version differ considerably in content and wording. The earlier text provided a more detail and explanation of what is a key plan in support of the NDR, and also referred to the findings of the HRA for the NATS, unlike the current text, which does not. This section should be revised and expanded to make it more comprehensive.

B4.39 (p37) (2.5 (p16)) It would be good to re-instate a sub-heading between this section and the preceding B4.38, (as in the earlier draft version), to make it clearer that what follows is a summary and conclusion of likely significant effect.

Table 3.1 (p40) Please refer to the comments made in relation to Table B.20 above.

C.2.2 (p43) The reference to Appendix A should be changed to Appendix 1.

C.2.3 (p43) (3.2.b (p20)) and **C.2.5 (p44)** (3.2.d (p20)) The text needs to be amended to reflect our discussions at the meeting that there is sediment ingress into the river from key off-route roads through the surface network of watercourses.

C.2. (p43) (3.2.c (p20)) The text correctly explains that changes in the groundwater levels could have an effect on the qualifying features, and this needs to be reflected in Table 3.1.

D.2.34 –D.2.39 (p55-57) (4.2.2.5 (p28-29)) We discussed road use on other roads at length during our meeting. An explanation about how the figures used in the modelling have been derived would be helpful, together with consideration of whether the most accurate and up to date figures have been used in Table D.2 (p57).

Sediment (and associated pollutants), via road run-off, can enter the River Wensum through the surface drainage network which could result in an adverse impact. Reasons for the riverine units of the River Wensum being in unfavourable condition include agricultural/run-off and siltation. Although much of the sediment comes from arable land, once it enters the highway, it is an issue for Norfolk County Council, as the relevant highways authority to address, and it was recognised that discussions have been held between the council and the Environment Agency about this problem .

The traffic predictions in Table D.2, when averaged out, show an overall decrease of traffic volumes on key off-roads in both 2017 and 2032, although traffic is predicted to rise on three individual roads by 2032. In analysing the impacts of the traffic prediction data it is also important to identify which of the key off-roads contributes the greatest sediment ingress into the Wensum. The predicted changes in traffic volumes should then be compared for each key off-road to see how sediment loads may change. Overall, increased traffic is likely to result in greater erosion of the roadside

verges leading to greater levels of silt entering the Wensum, if not mitigated for.

Therefore, Natural England is unable to agree with the conclusion that the NDR will lead to a reduction in sediment generation from the local road network.

Mitigation and Enhancement Measures
To demonstrate that there will be no impact on the integrity of the site, measures need to be implemented to reduce the impacts of diffuse pollution from these sources prior to, or in conjunction with, the construction of the NDR. It is recognised that only mitigation measures that fall within the footprint of the scheme can be considered within the planning process. However, evidence to demonstrate that improvements (already identified internally by the council) to reduce sediment ingress on these key off-roads will be completed by the time the NDR is open, should be submitted to demonstrate that effective mitigation measures will be implemented. Consideration needs to be given as to how these will be legally secured to ensure the improvements are delivered by the time the road opens.

Enhancement measures could also be considered by reducing sediment ingress upstream such as improvements at Lenwade Bridge where ingress points have been identified.

References
In an appendix to my letter I have included some links to documents that you may wish to refer to when making further revisions as discussed at our meeting.

Conclusions
With the exception of sediment ingress, we broadly concur with the conclusions of the Appropriate Assessment section of the HRA. The HRA is well structured and quite thorough, though would benefit by incorporating changes as outlined above. To make it more robust further detailed information or evidence needs to be included together with an explanation of how it has been used to support the conclusions or assumptions made. This should then demonstrate that there will be no overall increase in sediment ingress into the SAC, and therefore no adverse impact on the integrity of the River Wensum SAC can be concluded.

For clarification of any points in this letter, please contact Louise Oliver on 0300 060 1981.

This letter concludes Natural England's Advice within the Quotation and Agreement dated 15 January 2014.

As the Discretionary Advice Service is a new service, we would appreciate your feedback to help shape this service. We have attached a feedback form to this letter and would welcome any comments you might have about our service.

☒ The advice provided in this letter has been through Natural England's Quality Assurance process

The advice provided within the Discretionary Advice Service is the professional advice of the Natural England adviser named below. It is the best advice that can be given based on the information provided so far. Its quality and detail is dependent upon the quality and depth of the information which has been provided. It does not constitute a statutory response or decision, which will be made by Natural England acting corporately in its role as statutory consultee to the competent authority after an application has been submitted. The advice given is therefore not binding in any way and is provided without prejudice to the consideration of any statutory consultation response or decision which may be made by Natural England in due course. The final judgement on any proposals by Natural England is reserved until an application is made and will be made on the information then available, including any modifications to the proposal made after receipt of discretionary advice. All

pre-application advice is subject to review and revision in the light of changes in relevant considerations, including changes in relation to the facts, scientific knowledge/evidence, policy, guidance or law. Natural England will not accept any liability for the accuracy, adequacy or completeness of, nor will any express or implied warranty be given for, the advice. This exclusion does not extend to any fraudulent misrepresentation made by or on behalf of Natural England.

Yours sincerely

Louise Oliver
Land Use Ops – Cambridge Team

cc commercialservices@naturalengland.org.uk

Annex 1 – List of further potential reference material

- Geomorphological Appraisal (NE 2006) of the River Wensum SAC. English Nature Research Report 685. Sear DA & others. here

  This link is to the Geomorphological Appraisal, which is not referred to in the HRA reports although reference is made to the restoration plan, which the Geomorphological Appraisal ultimately fed into.

- The Wensum Diffuse Water Pollution (DWP) Plan might have been helpful, this is the current version however all DWPs are currently undergoing review and the Wensum plan is being re written as an exemplar plan.
  http://www.wensumalliance.org.uk/publications/Wensum_and_Potter_and_Scarning_Fen_DWPP_Finalversion.pdf

- There are quite a few useful doc s on the Wensum Alliance website here.

- There were a number of feasibility studies produced for the Environment Agency, which have been taken off the EA's website, probably due to their size. An example of one (though not the relevant stretch for the NDR) is attached here. I suggest you contact Martin Barrell at the Environment Agency for further details.

Mr Simon Allen - Environmental Scientist
Mott MacDonald
County Hall Martineau Lane
Norwich
Norfolk
NR1 2US

Our ref: AE/2014/117141/02-L01
Your ref: BSE/NOR/339156

Date: 23 May 2014

Dear Simon

DRAFT HRA ADDENDUM FOR NORWICH NORTHERN DISTRIBUTOR ROAD

Many thanks for sending through a draft copy of the addendum, dated May 2014, to the Habitats Regulation Assessment for the proposed Norwich Northern Distributor Road.

We would like to thank you for the amendments you have made to the text to take account of our earlier comments and for the additional information provided, and studies undertaken, regarding particular issues in the HRA of concern to the Environment Agency.

Following a detailed review of the document, we have the following comments to make.

3. Surface Water Quality

The revised approach to surface water quality issues as set out in the addendum indicates that there are three locations where traffic on roads near to the proposed NDR will increase as a result of the road construction, and where there is a direct or indirect connection to the River Wensum. These are the A1067 at Attlebridge, the A1067 at Lenwade, and Weston Hall Road. We consider that there is potential at all these sites for an increase in the input of silt and other pollutants as a result of the increase in AADT arising from the construction of the NDR. Despite your comments about the low risk of verge erosion on the A1067, we would strongly advise the adoption of the precautionary principle when considering impacts on the River Wensum Special Area of Conservation.

Therefore, we recommend that a series of mitigation measures are agreed and implemented for each of these sites in order to address the impacts of this increased risk of silt input. We do not consider that modelled reductions in traffic flows in other minor roads (e.g. Ringland Road, Taverham Lane or Costessey Lane) should be used to offset the likely increases elsewhere. This is because we would expect

Norfolk County Council, in partnership with other organisations, to be already working to implementing solutions to reduce impacts on the River Wensum SSSI/SAC in furtherance of the Water Framework Directive targets for the catchment.

The addendum to the HRA suggests a number of possible mitigation measures. These include Norfolk County Council's current maintenance regime such as grip clearance, as well as allied measures such as HGV restrictions on some of the road network.

In our view this does not represent a sufficiently robust mitigation strategy. In figure 3.1 of the HRA addendum a flow chart is presented to show steps in the assessment of likely significance of silt inputs from road crossings. The proposed mitigation measures are not robust enough to remove any adverse effects, and therefore it cannot be concluded that no further assessment or mitigation measures are required.

We recommend that for each of the three sites (A1067 Attlebridge, A1067 Lenwade and Weston Hall Road) a detailed mitigation plan to reduce the impacts of silt ingress is proposed. This should look proactively (rather than reactively) at the existing run-off management and pollution prevention measures, as well as identifying opportunities for local betterment through the installation of measures such as new SuDS features. The mitigation plan should set out in detail the proposed inspection regimes, what action is proposed at each site, the timings of actions, who is the responsible authority and who will fund the work.

When this plan is completed and agreed we will be in a much better position to agree that potential silt ingress as a result of the proposed NDR will not adversely affect the integrity of the River Wensum Special Area of Conservation.

4. Groundwater levels and protection

In terms of the risk to groundwater, we do not currently agree with the given conclusions. DMRB risk assessment method (Method C) has been used to put the 'source' and 'pathway' components in the 'Low Risk' category. However, the importance of the receiving waters has not been fully considered. In this case, the receiving groundwater is resting within a regionally important Principal Aquifer which supports the Wensum SAC, and as such would be designated as a feature of Very High Importance (HD 45/09, Table A4.3) and could result in effects that are Large Adverse or Moderate Adverse (Table A4.6).

In addition, according to the report submitted as part of Environmental Statement: Volume II: Chapter 9. Geology and Soils (Contaminated Land Desk Study and Preliminary Interpretative Report, dated November 2013), drawings Geological Information 50m corridor Sheets 1 and 2 (of 31) dwg no. R1C093-R1-1163/1 and R1C093-R1-1156/2 (pdf pp. 126-127), the thickness of Crag deposits does not generally exceed 3 metres except for the borehole BHPW1A at beginning of the route (chainage 138 m), and the base of Crag is proven at approximately 2 metres below ground level at the majority of investigated locations. As such, the majority of the unsaturated zone pathway for unlined swales would comprise the Chalk geology

and the base of the infiltration lagoons is also likely to be located directly on the Chalk. Given the nature of the Chalk in this area (fracture flow, low clay mineral content), this would put the discharge into 'Medium Risk' category (overall score of 190 for unlined swales and 205 for infiltration lagoons). In addition, Chalk geology would exhibit much higher transmissivity to pollutants should a spill incident occur.

Allowing infiltration from the swales under the current design would mean that surface water run-off passes through one level of treatment only. No estimation has been made as to the proportion of the run-off that would infiltrate the swale directly rather than flowing into the sedimentation lagoon. In addition, 'first flush' would also be allowed to infiltrate after passing through one stage of treatment only.

Given the limited extent of the clay rich geology and the need for more than one treatment stage, we consider that the swales should be lined at this location.

Notwithstanding, the lining of the swales is primarily a groundwater protection issue. As per our previous comments, we maintain that we are satisfied that the HRA has shown no adverse impact on the SAC via groundwater, provided the quality of groundwater at the discharge point is afforded an appropriate level of protection (which includes an adequate design of the drainage system). In this location, that would include the lining of swales.

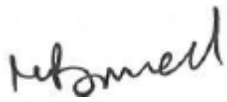
5. Flood risk

In our previous response we commented on the need to ensure that the temporary drainage arrangements (ditches) proposed to intercept run-off from the working areas in heavy rainfall events would be appropriately sized.

This is addressed in section 5.1 of the HRA Addendum. We can confirm that we are satisfied that this has demonstrated that the ditch will be appropriately sized to prevent run-off from reaching the Wensum.

Please do contact us if you would like to discuss any aspect of this response further. If you would like us to review any additional information prior to submission, this will need to be part of an extended charging agreement.

Yours sincerely



MR MARTIN BARRELL
Sustainable Places - Planning Specialist

Direct dial 01473 706044
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Date: 2 June 2014
Our ref: DAS73531/121668
Your ref: n/a

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Mr Jon Barnard
Norfolk County Council
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BY EMAIL ONLY

Dear Jon

Discretionary Advice Service (Charged Advice)
Contract Reference: DAS7353/121668
Development proposal and location: Norwich Northern Distributor Road

Thank you for your consultation on the above.

This advice is being provided as part of Natural England's Discretionary Advice Service. Norfolk County Council has asked Natural England to provide advice upon:

- the Draft Addendum to the Habitat Regulations Assessment (HRA) for the Norwich Northern Distributor Road (NDR)

This advice is provided in accordance with the Quotation and Agreement dated 29 May 2014.

The following advice is based upon the information within the Draft Addendum to the Habitat Regulations Assessment, dated May 2014.

I welcome the incorporation of many of the amendments suggested in my letter to Simon Allen at Mott MacDonald, dated 5 March 2014, and for the additional survey work undertaken and information supplied in the addendum. These all help to provide greater clarity and understanding of the issues concerned.

Following a review of the addendum I have the following comments to make (using the same headings etc as in the document):

3. Surface water quality
As a result of the revised approach, detailed in the addendum, three roads near the NDR, with either a direct or indirect connection to the River Wensum Special Area of Conservation (SAC), were identified initially where large increases in the predicted levels of traffic using these roads could lead in increases in silt and other contaminants entering the river. These roads were the A1067 at Lenwade, the A1067 at Attlebridge and Marl Hill Road. In addition, a smaller sized increase was identified on Weston Hall Road. During road surveys of Marl Hill Road no direct or indirect connections to the Wensum were identified, and so this road was excluded from further examination.

When using the diagram in Fig 3.1 to assess likely significant effect of sediment ingress for each of the three remaining roads, application of the precautionary principle (using the worst case scenario), would lead to a positive identification for potential for significant adverse effects which would then trigger the need for mitigation measures to be proposed to reduce significant adverse effects.

It is also noted that the Highways Agency 's Water Risk Assessment Tool (HAWRAT) assesses the potential impact of contaminant loads from vehicles rather than from road verges.

Please check the accuracy of the traffic data provided in Table 3.1 as some of the figures relating to the percentage difference do not appear to be correct. For example for Marl Hill Road, the percentage change difference for 2017 is +98.1% whilst in Table D2 of the submitted HRA (using the same data) it was +49.5%. I calculate different percentage differences for 2032 for the A1067 at Attlebridge and other routes than the ones given in the table, although it may be that I am using a different formula to calculate the figures.

Overall, increased traffic is likely to result in greater erosion of the roadside verges leading to greater levels of silt entering the Wensum, if not mitigated for. Sediment ingress is an on-going issue, and as a competent authority and as the highways authority, Norfolk County Council should be proactively working currently, together with other parties, applying solutions to address and reduce sediment ingress in the Wensum. Therefore, it is not appropriate to offset reductions on other key routes, identified through the traffic modelling, against the predicted increases.

A number of potential mitigation measures are identified in the addendum, though details about funding, how, when, where and by whom these would be implemented is sketchy or lacking. Without detailed information about the measures it cannot be concluded that adverse effects would be removed.

As mentioned in my letter to Simon Allen at Mott MacDonald, dated 5 March 2014, evidence to demonstrate that effective mitigation measures will be implemented is still required. The county council should confirm how it will ensure appropriate ditch maintenance in the long-term. For example in section 3.6.2 paragraph 5 it states '*Even if the pipe was discharging into the ditch, there is sufficient distance and vegetation within the ditch to remove sediment before it reaches the Wensum*.' The report also mentions areas of vegetation and reed, which will provide a level of filtration in several locations. If the presence of vegetation is being relied on to provide filtration and reduce impacts then there needs to be some assurances that there will be control/ agreement over vegetation/ditch maintenance.

Where grips and run off points can be improved by implementing sediment traps further details of locations and measures should be provided.

Section 3.8.2 first paragraph states that '*NNC's maintenance regime for existing road drainage systems along roads that drain into the Wensum can be considered mitigation*.' This needs more detail of how mitigation is provided if it is to be considered as such in the HRA.

Section 3.9 paragraph 4 & 7 more detail is needed on how erosion of soft verges will be addressed.

A mitigation plan detailing proactive measures to reduce silt ingress for each road (A1067 at Lenwade, the A1067 at Attlebridge and Weston Hall Road) should be produced. Any potential for local enhancement measures could also be considered.

Once this plan has been produced and agreed, Natural England should be able to conclude that potential sediment ingress as a result of the proposed NDR will not adversely affect the integrity of the River Wensum SAC.

For clarification of any points in this letter, please contact Louise Oliver on 0300 060 1981.

This letter concludes Natural England's Advice within the Quotation and Agreement dated 29 May 2014.

As the Discretionary Advice Service is a new service, we would appreciate your feedback to help shape this service. We have attached a feedback form to this letter and would welcome any comments you might have about our service.

☒ The advice provided in this letter has been through Natural England's Quality Assurance process

The advice provided within the Discretionary Advice Service is the professional advice of the Natural England adviser named below. It is the best advice that can be given based on the information provided so far. Its quality and detail is dependent upon the quality and depth of the information which has been provided. It does not constitute a statutory response or decision, which will be made by Natural England acting corporately in its role as statutory consultee to the competent authority after an application has been submitted. The advice given is therefore not binding in any way and is provided without prejudice to the consideration of any statutory consultation response or decision which may be made by Natural England in due course. The final judgement on any proposals by Natural England is reserved until an application is made and will be made on the information then available, including any modifications to the proposal made after receipt of discretionary advice. All pre-application advice is subject to review and revision in the light of changes in relevant considerations, including changes in relation to the facts, scientific knowledge/evidence, policy, guidance or law. Natural England will not accept any liability for the accuracy, adequacy or completeness of, nor will any express or implied warranty be given for, the advice. This exclusion does not extend to any fraudulent misrepresentation made by or on behalf of Natural England.

Yours sincerely

Louise Oliver
Norfolk and Suffolk Area Team

cc Simon Allen, Mott MacDonald
Martin Barrell, Environment Agency
commercialservices@naturalengland.org.uk

Date: 27 August 2014
Our ref: C7353/130289
Your ref: n/a

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BY EMAIL ONLY

Dear Jon

Environment Agency and Natural England comments on Revision B of the Addendum to the Habitats Regulations Assessment for the proposed Norwich Northern Distributor Road

Please find a joint response from the Environment Agency and Natural England to Revision B of the Addendum to the Habitats Regulations Assessment (HRA) (dated July 2014) for the proposed Norwich Northern Distributor Road (NDR). We are submitting this joint approach as it streamlines the work involved. Note that there is additional advice from the Environment Agency under 'Water Framework Directive' below.

We also thank you for the additional work that has been undertaken in response to the comments that we have sent you following receipt of earlier versions of the addendum.

1. Surface Water Quality

In our previous responses we indicated that we would like to see mitigation measures agreed and implemented in order to address the impacts of an increased risk of silt input to the River Wensum Special Area of Conservation (SAC) at a number of sites, notably the A1067 at Lenwade, the A1067 at Attlebridge and Weston Hall Road. We have the following advice to make in light of the amendments to the most recent version of the addendum to the HRA.

A1067 at Attlebridge and Lenwade

Figure 3.1 (p14) outlines the process for assessing the likely significance of silt ingress at each road. Given that at Attlebridge there are soft verges on at least 50% of the road catchment draining to the river (see Drawing MMD-233906-DT-1005 in Appendix B), we do not agree that this road crossing should drop out at the third box down in Figure 3.1. Rather, the assessment should continue to a consideration of whether there is sufficient treatment and/or a maintenance programme in place to ensure that sediment is removed prior to discharge.

We note that the Highways Agency Water Risk Assessment Tool (HAWRAT) has been used for Attlebridge, and the conclusion of the assessment is that the site "screens out" for both pollutants and sediment and so no further assessment or mitigation is required to treat runoff. However, it is unclear whether the HAWRAT tool is appropriate for assessing impacts from non-routine runoff (such as silt) on surface waters, particularly for sites such as the River Wensum SAC which is failing to meet its target condition due to siltation. We would welcome further discussion on this point.

The commitment by Norfolk County Council to further investigations to understand better the drainage structures in place along the A1067, particularly at Lenwade where it is not clear whether the discharge runs directly into the River Wensum or a tributary, is welcome, as is the commitment to improve the maintenance of existing drainage structures at both bridges. All relevant detail from the further investigations and the improved management regime will need to form part of the HRA.

However, insufficient consideration has been given to the option of developing improved Sustainable Drainage Solutions (SuDS) options at the A1067 crossings at both Lenwade and Attlebridge. Improvements at these locations would have the effect of mitigating any adverse impacts arising specifically in these areas (although we note the comments in respect of the expected frequency of tracking over verges), but would also contribute to mitigating any overall increase in silt ingress as a result of the NDR.

Measures might include the provision of new attenuation ponds/silt traps on nearby land. At Attlebridge, for example, there may be opportunities to modify the open dyke connected to the tributary stream (see Appendix B Figure B.2 for location), so that it is more efficient at trapping silt before it enters the Wensum. This might mitigate for the impacts of silt ingress from the north side of the road, although it would not address input from the slipway on the south side. At Lenwade, there may be opportunities for silt traps on land north of the A1067, subject of course to landowner agreement. Such options have the potential to provide betterment to the SAC. This is in contrast to the proposed actions which simply adopt best practice to manage the existing arrangement.

Weston Hall Road

We have continuing concerns over the potential for silt ingress to the Wensum from Weston Hall Road, especially given that HGV numbers are predicted to increase significantly in the future due to the link road between the A1067 and the A47. Incidentally, under 3.7.2 (second paragraph) it is unclear if the HGV ban has been implemented in Hockering already (in Spring 2014?) or will be implemented in Spring 2015.

The drainage network and pathways in this area are clearly complex and it is a little difficult for us to make detailed comment without more baseline data on the nature of the local watercourses, and in particular their flow regimes (e.g. flow volumes and whether permanent or seasonal) and their ecological value. However, given this caveat we have the following comments/observations.

Where possible it might be better to keep drainage from the road separate to that from other watercourses. This would make it easier to treat and remove sediment from road run-off as the volume of water involved will be more manageable. So, for example, might it be possible for the (in-filled) section of ditch along the lower part of Weston Hall Road (on the Weston Hall Estate side) to be reinstated to accept just road run-off, and widened in one or two locations to provide silt traps? Similarly, could Ditch 1B be modified to provide some on-line silt traps? Also, are there opportunities to provide SuDS options further upslope to provide solutions closer to the source of the silt?

Of the options presented for silt reduction within the Weston Hall Estate, our preference is for a silt trap in Ditch 2A. However, given our comments below under 'Water Framework Directive' about the need to avoid additional structures in watercourses, could the design of this feature be modified so that it consists of a wider, deeper section of channel (without the need for a structure) to encourage silt to drop out?

For the Dinosaur Park, we note the intention of the landowner to dredge a section of Ditch 2A. If this is the case, care must be taken to ensure that the existing ecological value of the watercourse is not adversely affected, and due regard is given to protected species such as water vole. Norfolk County Council's ecologist may be able to provide further advice on this aspect. The same points apply to

the proposal to dredge the section of Ditch 1B between Culvert 1 and Culvert 3. Care is also required to ensure that any in-channel maintenance does not increase silt input to the Wensum. An alternative to dredging might be the creation of one or more on-line silt traps (without associated weir structures) as suggested above.

Of the options presented for silt reduction within the Dinosaur Park, we think a modified Option 2B (silt trap without weir) might be the most appropriate. Option 3 (reed planting) also appears to be a sensible measure. However, it should be noted that most of the land between Ditch 1B and Ditch 2B is designated as a County Wildlife Site (Site 1345 – Weston Meadow), and any proposals for this area must be compatible with the nature conservation interest of the site. Norfolk Wildlife Trust should be consulted about any work that may affect the County Wildlife Site.

We believe certain clarifications/revisions to the mitigation proposals for Weston Hall Road are required, and therefore it is premature to be entering into legal agreements with landowners until these issues are satisfactorily addressed.

Mitigation Measures Action Plan

As a general point, information about the proposed mitigation measures to address silt inputs to the Wensum at the three highest risk road crossings is dispersed throughout the HRA. After taking account of our comments, and incorporating any revised/additional proposals for mitigation measure in light of these comments, we consider that it would be appropriate for the HRA to include a Mitigation Measures Action Plan. This should preferably be in tabulated form, and set out the detail of the proposed mitigation at each site (e.g. action, timing/frequency, funding source, responsibility for implementation). This was something that we requested in our response to the earlier version of the addendum to the HRA. There will also need to be agreement over who is ultimately responsible for oversight of the overall programme of mitigation measures.

2. Water Framework Directive Advice

The Environment Agency has reservations about the construction of new sluices, dams or other obstructions across watercourses, especially those that support fish populations. Such structures provide barriers to fish migration, prevent access to valuable spawning and feeding habitat, and can prevent waterbodies achieving their targets under the Water Framework Directive. If the watercourses under discussion at this site support fish then alternatives to new sluices should be found. At the very least, new structures must be passable to eels, salmonids and coarse fish.

3. Groundwater Levels and Protection

Considering section 4.2.3, we support the proposed approach for managing drainage in catchments CA1 and CA2. This reflects the approach previously outlined in the submitted Addendum to the Environmental Statement and the Flood Risk Assessment.

4. Future work

At the issue specific hearing on 24 July 2014, the Inspector asked Natural England about progress on the HRA, given the importance of being able to conclude that the development will not be likely to have a significant effect on the SAC. We understand that a meeting is being scheduled for early September and we look forward to attending.

In the meanwhile, if you have any questions please contact either Martin Barrell on 01473 706044 or me (on 0300 0601981).

Yours sincerely

Louise Oliver
Norfolk and Suffolk Area Team

cc Simon Allen, Mott MacDonald
Martin Barrell, Environment Agency
Nick Tribe, Natural England

NDR Meeting

Held on: 09 September 2014 Time: 14:00 am
Venue: Room 316, County Hall

Present:	Jackie Fookes (JF)	-	Mott McDonald
	Rebecca Day (RD)	-	Mott McDonald
	Mark Kemp (MK)	-	Project Team Manager (NCC)
	Beccie Howard (BH)	-	NDR Business Support Assistant (NCC)
	Graeme Taylor (GT)	-	Flood Risk Engineer (NCC)
	Louise Oliver (LO)	-	Natural England
	Martin Barrell (MB)	-	Environment Agency
	Nick Tribe (NT)	-	Natural England
	Simon Allen (Via Telecon) (SA)	-	Mott McDonald
Apologies	Graham Brown (GB)	-	

		Action
1.0	**Surface water quality – A1067 at Attlebridge and Lenwade**	
1.1	**A1067 Figure 3.1 – Assessment Process**	
	RD advised of 2 key potential impacts considered in the HRA: 1. Increased silt Ingress from increased verge tracking; and 2. Increased contaminants in run off associated with increased traffic. LO stated that an increase in traffic on the A1067 will increase the risk of verge erosion. RD discussed the distance between the edge of the road and the grassed verge reducing the likelihood of verge tracking. LO advised there is evidence of lorries pulling over and eroding the soft verges in sections between the two river crossings at Attlebridge and Lenwade. This increases the sediment load in the runoff and consequently in the Wensum River. RD stated the increase in traffic does not directly correlate with the increase in verge erosion due to the distance between the edge of the road and the grassed verge. HGV's should not pull over unless it is an emergency. RD agreed with LO that the question in Figure 3.1 should incorporate continuous verge tracking but felt the reason for not	

	progressing to the next question was clearly set out in Section 3.7 of the HRA Addendum report stating "*Although there is a significant increase in traffic along the A1067 and some stretches of grass verges, an increase in traffic is unlikely to increase verge erosion due to the distance between the edge of the road and the road verge (only infrequent tracking over verge likely)*.". LO suggested visual checks of verge tracking would be required and included in the proposed Mitigation Measures Action Plan (MMAP).	
1.2	**HAWRAT and mitigation for reducing silt** RD advised HAWRAT is suitable for assessing the impact of routine runoff on SACs (as per guidance) whereby the tool uses differing quality thresholds for contaminants and sediment to 'pass'. HAWRAT considers the impact of pollutants and sediment directly associated with number of road vehicles but not from other sources such as from land runoff or verges. HAWRAT thresholds for contaminants and sediment is relative to EQS required to achieve WFD Good Ecological Status and the tool identifies runoff from the road to pass this level of quality. A question was posed stating 'Is water quality acceptable at the point of discharge?'. Treatment and maintenance considerations needed. LO discussed the maintenance of drainage. Are these able to cope with increase in traffic including HGV's? Reassurance was requested for remedial action where necessary as there are known sources of silt inputs to the river in this area. The draft River Wensum Diffuse Water Pollution Plan may inform this further. LO suggested a watching brief by NCC to monitor silt ingress via the highway drainage systems and instigate remedial action if necessary. **Action: Seek update on progress of the draft River Wensum Diffuse Water Pollution Plan from Hannah Wallace** MB stated the drainage features are not completely clear and that further works to understand the existing drainage systems may need to be completed RD agreed there was some evidence of sediment accumulation at Attlebridge where a small section of road drains to a tributary of the Wensum and this needs to be investigated further. Other discharges to the Wensum directly appear to be acceptable (based on HAWRAT) based on the rivers ability to disperse and dilute concentrations. A survey of the existing drainage systems would be undertaken by NCC to confirm discharge locations. MK stated the gully pots and other systems are maintained on an annual basis unless there is a notable incident (e.g. blockage/flooding/spill), based on correspondence with the Highways team responsible for this area (James Winter). Starting to identify which features need to be emptied more frequently. LO mentioned the need to identify and map all gullies and other drainage features along the A1067 and Weston Hall Road. NCC will commit to review/ monitor / inspect these gullies and	**LO**

	adjust maintenance as required. NT asked if silt can be monitored. JF advised that a system is in place where the maintenance contractor who clear out the gullies can monitor silt removed but simply as a 'present' or 'not present' approach. Quantities cannot be recorded. LO raised her concerns over the need to understand, prior to the opening of the NDR, baseline conditions of quantity of silt entering the Wensum/tributary via the existing drainage system. All agreed a mechanism to measure the depth of silt prior to clearing the gullies out could give an indication of quantities likely to be generated from the road and visual inspections of outfalls to watercourses could identify any sediment accumulation. This would provide reassurance is needed to ensure the justifications for completing the works is correct. LO posed some questions; who will maintain these? How often will these be maintained? Any remedial action? What features are present? (LO stated that photographs could be a good way of monitoring.) These questions should be addressed within the MMAP.	
1.3	**SuDS improvements**	
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	RD to speak with Rob verbally by 11/09/2014 *(Completed 11.09.14. Subsequent site visit 16.09.2014)* Circulation of draft minutes w/c 15th Sept with comments returned and finalised by 23rd Sept. Framework for action plan by early October for NE to respond to Inspector by their 10/10/2014 (DCO 26 deadline). Contractors to complete surveys of areas 14/10/2014 Final draft MMAP by 13th October for NE/EA comment. Respond to draft MMAP by 22nd October. Final MMAP by the first week in November. RD to speak with James Winter to check when the next gully clear outs are due along A1067. (ASAP) LO to seek update from Hannah Wallace on progress of the draft River Wensum Diffuse Water Pollution Plan by 23rd Sept.	**RD** **RD** **RD** (NT/LO to issue response) **RD** **All** **RD** **RD** **LO**

Signed:	**Dated:**

Record of telephone conversation

Project title	Norwich Northern Distributor Road				
Project no	339156	**File no**			
Between (for MMG)	Becky Day; Simon Allen & Jackie Fookes	**Date**	11.09.2014	**Time**	10:00
And (name)	Martin Barrell & Rob Dryden	**Organisation**	Environment Agency	**Phone no**	01473 706043
Subject	NDR HRA – Final agreed approach				

Summary

1. Introductions

Individual introductions made.

The purpose of the meeting was for Rob Dryden (Lead in EA Biodiversity and Fisheries team for the River Wensum) to provide further clarification to points made in the joint EA/NE letter dated 27th August 2014 and to agree to the proposed way forward that was identified during the meeting on 9th Sept 2014 between MM, NCC, EA and NE.

2. Part lining and planting of lagoons

RD summarised the need to improve the existing drainage system to enhance biodiversity as raised in 2005 and again in 2007. The drainage design at that time needed to be improved by creating shallower lagoons with gentler sloping sides, with the provision of planted permanent wet areas.

BD explained the reasons behind not providing planting within the primary lagoon and/or lining and planting parts of the infiltration lagoons:

- The main purpose of the lined primary lagoon is for spillage containment. Creating a bi-functioning lagoon that both creates habitat and encourages wildlife to enter but also to contain a tanker spill would be disingenuous. A major spill resulting in significant loss of ecology (particularly protected species) could have significant legal implications for NCC. The EA felt that if the lined lagoons were planted up we would be enhancing biodiversity – if there was a spill there should be no implications because we were not claiming habitat creation. If we did not plant them up they would likely to be colonised. **JF will check the legality with NE**
- The lined secondary ponds at Lagoon 17, 18 and 18A will be planted with reeds for treatment purposes prior to discharge but with ecological benefits.
- No permanent wet areas can be provided at Lagoons 13 and 13a due to their close proximity to the airport in order to reduce the potential for bird strike.
- Part lining of secondary infiltration lagoons is restricted by a constraint provided by the EA flood management team on half drain down times (based on the guidance within the CIRIA SuDS Manual) – the lagoon should drain by half in less than 48 hours. Lining part of the lagoons would further reduce drain down times and lagoons would need to be enlarged to accommodate the loss of permeable area. Enlarging lagoons now would require additional land take under compulsory purchase which NCC would like to avoid.
- The infiltration lagoons will be seeded with grasses and wildflowers to enhance ecology.

SA noted there were locations where poor drain down times could result in seasonal or permanent wet areas. There may be opportunities in the future to plant up these areas within the infiltration

ponds.

JF raised the issue of cost. The cost of installing additional wet areas simply to enhance biodiversity would need to be justified as this is public money. Public response to DCO application so far suggests the local residents are not interested in ecological mitigation or enhancement. Wetland areas proposed at the Springs in Rackheath are required to mitigate against for areas lost in the locality, making a like for like replacement.

RD requested a formal response to this issue (***Action: BD***). The EA will then respond accordingly.

3. Weston Hall Road – silt trap design and ditch dredging/clearance

From the meeting on 9th Sept it was agreed to install a silt trap along Ditch 2A and Ditch 1B, with the planting of reeds upstream of Culvert 2 (see Figure 3.3 in Addendum to HRA for referenced plan).

The EA letter dated 27th August suggested the silt trap design to be a deepened, widened channel section rather than a weir type structure. This would promote fish passage and reduce impacts on geomorphology. BD noted the presence of sluices up and downstream of this location already providing this type of barrier. BD requested further clarification from RD on silt trap design. RD felt he could not confirm appropriate design without visiting the site and understanding better the hydrological regime of the area. This meeting would also discuss the betterment proposals made within the Addendum e.g. dredging Ditch 1B. ***BD to arrange a site visit on Tues 16th Sept at 11:30am and confirm arrangements with RD.***

RD emphasised the need for any additional sediment entering these ditch systems from the highway to be prevented from reaching the Wensum due to its unfavourable condition.

NCC is keen to progress with the local land owner agreements to ensure NCC have agreements in place to fulfil the mitigation required under the HRA. Once the location and design mitigation measures in this location have been agreed with the EA, NCC would proceed with the local agreements.

4. A1067 – survey of existing structures and further explanation of the last paragraph under 'A1067 at Attlebridge and Lenwade' (letter 27/08/14) regarding additional SuDS.

BD explained what was discussed at the meeting regarding the potential impact of NDR on the Wensum in terms of increased silt in road runoff from (1) increased traffic and (2) increased verge erosion from vehicle tracking. In response to these two issues we have already identified in the HRA Addendum that (1) DMRB HAWRAT (HD45/09) is suitable for assessing the impact of road runoff on SACs and shows in this location that long and short term impacts associated with runoff contaminants meets the EQS under WFD; and (2) verge tracking will not increase as a result of increased traffic due to the distance between the white line along the road and the edge of the grass verge. Only during emergency situations would a car/HGV be required to pull onto the verge.

JF requested further clarification as to why further mitigation was necessary in these locations as suggested in the letter (e.g. new attenuation ponds) to which RD responded to say NCC are required to work with the EA in improving the quality of water entering the Wensum via the highways. JF felt this was not relevant to the HRA where only the impacts of NDR are being considered; rather this is a separate issue to be agreed outside the HRA.

RD raised the requirement to take the "precautionary approach" where the risk was beyond reasonable doubt. As agreed in the meeting on 9th Sept, a survey of the existing drainage structures will be undertaken by NCC to understand fully how runoff is captured, treated and discharged to the Wensum in the Attlebridge and Lenwade locations. Silt present within the gully pots and receiving ditches/watercourse would be monitored and recorded as a baseline condition. Once NDR is constructed further monitoring would ascertain whether improvements to the existing system would be required due to any increase in silt attributed to the increased traffic from the NDR.

BD asked RD what he thought would trigger the need for mitigation based on the silt monitoring results. RD suggested this was something for NCC to decide and present in the Mitigation Measures Action Plan (MMAP) for the EA to review. Any increase in silt to the Wensum would need to be mitigated against.

5. Mitigation management action plan (MMAP)

RD agreed to the proposed framework of the MMAP as discussed at the meeting on 9th Sept.

For the A1067, the MMAP should include the need to define baseline conditions of existing system and visual assessment of verge tracking. Each system feature to be identified in a tabular format with details of proposed maintenance: frequency, responsibility, monitoring, etc. RD requested the open dyke and tributary to the Wensum at Attlebridge to be listed and monitored in this location.

Along Weston Hall Road, the new structures would require similar tabulated information; monitored and maintained to ensure effective removal of silt.

How and by whom monitoring is recorded and reported back to NE/EA should be set out in the plan. This needs to consider 4-5 years in the future (post NDR construction).

The draft River Wensum Diffuse Water Pollution Management Plan to be reviewed once a draft is provided by Louise Oliver (NE) and consideration given to the inclusion of this location within the plan.

JF explained the deadlines agreed:

- Framework of MMAP report to be provided to NE/EA by end of Sept to feed into the 10th Oct deadline for NE response to ExA.
- Draft MMAP report to NE/EA by 13th October.
- Final MMAP agreed by all parties by early November 2014.
- All local agreements, consents, etc. for this element of the work to be in place by July 2015.

Action	To	A	I	C	Sign	Date
SA/JF to speak to NE regarding legal implications for NCC of promoting aquatic habitat within a spillage containment structure.						
BD to arrange access to Weston Hall Estate and Dinosaur Park for BD/RD to agree betterment/mitigation within ditches receiving runoff from Weston Hall Road.						
BD (with Mark Kemp from NCC) to arrange drainage survey of A1067 at Attlebridge and Lenwade to inform MMAP.						
SA/JF/RD to review draft River Wensum Diffuse Water Pollution Management Plan.						
	Return to					

Nichols, Jonathan D

From: Day, Rebecca
Sent: 30 September 2014 15:44
To: 'martin.barrell@environment-agency.gov.uk'; 'wojtek.koryczan@environment-agency.gov.uk'; nick.tribe@naturalengland.org.uk; louise.oliver@naturalengland.org.uk; rob.dryden@environment-agency.gov.uk
Cc: 'Kemp, Mark'; 'Kurek, Marcin'; Fookes, Jacqueline E
Subject: Weston Hall Road - Drainage improvement plans
Attachments: Motts_Meeting_09_09_2014_EA and NE (HRA)_FINAL2.doc; NDR HRA_Teleconference with EA_11 09 2014_FINAL.docx; R1C093-R1-4807 4808 Weston Hall Road Estate Plans_For comment.pdf

All

Thank you, Louise, for your comments on the meeting minutes. I have made just one final change to the text. Hopefully we are all now in agreement with the attached final versions of the meeting/telecon minutes.

Further to the Weston Hall Road site visit, myself, Rob Dryden and Adam Thurtle (EA project manager for River Wensum Strategy) discussed the following improvements and maintenance to the Weston Hall Road drainage to prevent any additional silt associated with the increased traffic from entering the River Wensum. The main focus was to avoid putting any new structures within the watercourses in order to maintain continuity upstream e.g. for fish and lamprey migration. The four areas for mitigation are as follows:

Mitigation Areas 1 & 2

Ditch 2A, running parallel to Weston Hall Road, is quite small and has a reasonable gradient. As a result, fine sediment (sand, silt and clay) is transported through the system leaving a relatively clean gravel bed. This section is likely to be of ecological value. It was agreed that putting any structure here would adversely affect the longitudinal connectivity of the watercourse. In addition, the potential for silt storage/capture is quite limited.

There are two natural silt traps (or sinks) present where the existing channel widens, dissipating flow energy and resulting in deposition of suspended sediment. The proposed measures are to (1) carry out initial and periodic dredging of an existing natural silt trap present downstream of Culvert 1 (Area B on Drawing Ref R1C093-R1-4807 attached); and (2) Initial and periodic dredging of an existing natural silt trap present downstream of where Ditch 2A flows westwards at its northern extent (Area A on Drawing Ref R1C093-R1-4807 attached). Access to these areas is restricted and may need undertaking by the landowner. Periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Mitigation Area 3

The plan is to remove existing wooden sluice upstream of Culvert 1 as appears to serve no purpose. The culvert removal would need to be preceded by silt removal in a short section of Ditch 1B upstream of the culvert in order to prevent a pulse of sediment passing downstream. The long term measures in this area is to dredge and continue to maintain small intermittent sections along Ditch 1B to act as online silt traps, marked as approximate Areas C-E on Drawing ref R1C093-R1-4808 attached. It was agreed that there was little benefit in comprehensive desilting of this watercourse since this would have the consequence of improving the transport of sediment downstream to the River Wensum, the very thing we are trying to avoid. Tree cover and vegetation to remain in undisturbed sections to continue to act as a silt trap.

The planting of reeds upstream of Ditch 2B was considered ineffective as the overshadow of the trees would make it difficult to establish good growth. In addition, the alder woodland is of existing conservation interest and therefore should not be felled to make way for reed.

Consideration of silt disposal will be given where the invasive Himalayan Balsam (and seeds) is present.

Similar to Areas 1 and 2, periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Mitigation Area 4

We looked at the potential for local storage of water/silt in the seasonal ditch system on the east side of the road just upstream of Culvert 3 to capture and divert flows coming down the hill from the south before it enters Ditch 1B and 2A. A small section of ditch remains dry on the eastern side of the road due to the diversion of previous ditch and installation of Culvert 3 (located southwards of Culvert 3), marked as a potential 'New Soakaway' on Drawing ref R1C093-R1-4808 attached. The dry ditch in this location could act as a soakaway with new grips directing flows from the south into here reducing volume of runoff reaching Ditch 1B and 2A. Some hedge and tree clearance required and construction of new grips through highway verge.

Areas 3 and 4 could be maintained by NCC maintenance team.

How each area is managed and maintained will be set out in the Mitigation Measures Action Plan, including the consideration of protected species and measures to prevent silt being transported downstream during dredging works.

We welcome your comments on these plans. We are under a lot of pressure to get these measures agreed as part of the HRA sign off. Could I therefore ask for all comments to be sent by **CoP Thursday 2nd October**. I know this is a quick turnaround time but we are keen to agree these measures as soon as possible.

Kind regards

Rebecca

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
CEnv
Environmental Scientist

Mott MacDonald

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W www.environment.mottmac.com

Normal working days: Tues, Wed, Thurs.
(Thursdays working from home)

From: Hearsum, Ian J
Sent: 25 September 2014 17:01
To: Day, Rebecca
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Rebecca,

Please see attached draft of the mark-ups. They have taken an hour and a half so far.

Kind Regards

Ian Hearsum

External Lighting Technician

Mott MacDonald

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69-75 Thorpe Road
Norwich
NR1 1UA
United Kingdom

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W www.mottmac.com

From: Day, Rebecca
Sent: 25 September 2014 09:25
To: Worsley, Alastair
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Alistair

Thanks for sorting this.

Could a draft be prepared by the end of today?

Other minor amendments to the plans may follow early next week following consultation.

Many thanks
Becky

From: Worsley, Alastair
Sent: 25 September 2014 08:34
To: Day, Rebecca
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Becky,

I've handed this over to Ian Hearsum in our office who will be able to crack on with this almost right away. When do you need this all completed by?

Thanks

A

From: Day, Rebecca
Sent: 24 September 2014 15:39
To: Worsley, Alastair
Cc: Fookes, Jacqueline E
Subject: Weston Hall Road - Drainage improvement plans

Alastair

Apologies for the delay in sending this through. I had a fight with the new scanner!

Please could you arrange for drawings 4807 and 4808 to be updated as shown on the PDF provided in the following folder:
<File:\\UKCAMBVMADC03\Projects\Norwich\MM Projects\339156 - NDR Environmental Support 2014\CAD\HRA local agreement plans>
The CAD file is also available here.

If you, or the person undertaking the drawing changes, have any questions then please give me a call!

Thanks
Becky

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
CEnv
Environmental Scientist

Mott MacDonald

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http://www.rtpiconsultants.co.uk/consultant/main/1065

NDR Meeting

Held on: 09 September 2014 Time: 14:00 am
Venue: Room 316, County Hall

Present:	Jackie Fookes (JF)	-	Mott McDonald
	Rebecca Day (RD)	-	Mott McDonald
	Mark Kemp (MK)	-	Project Team Manager (NCC)
	Beccie Howard (BH)	-	NDR Business Support Assistant (NCC)
	Graeme Taylor (GT)	-	Flood Risk Engineer (NCC)
	Louise Oliver (LO)	-	Natural England
	Martin Barrell (MB)	-	Environment Agency
	Nick Tribe (NT)	-	Natural England
	Simon Allen (Via Telecon) (SA)	-	Mott McDonald
Apologies	Graham Brown (GB)	-	

		Action
1.0	**Surface water quality – A1067 at Attlebridge and Lenwade**	
1.1	**A1067 Figure 3.1 – Assessment Process**	
	RD advised of 2 key potential impacts considered in the HRA: 1. Increased silt Ingress from increased verge tracking; and 2. Increased contaminants in run off associated with increased traffic. LO stated that an increase in traffic on the A1067 will increase the risk of verge erosion. RD discussed the distance between the edge of the road and the grassed verge reducing the likelihood of verge tracking. LO advised there is evidence of lorries pulling over and eroding the soft verges in sections between the two river crossings at Attlebridge and Lenwade. This increases the sediment load in the runoff and consequently in the Wensum River. RD stated the increase in traffic does not directly correlate with the increase in verge erosion due to the distance between the edge of the road and the grassed verge. HGV's should not pull over unless it is an emergency. RD agreed with LO that the question in Figure 3.1 should incorporate continuous verge tracking but felt the reason for not	

	progressing to the next question was clearly set out in Section 3.7 of the HRA Addendum report stating "*Although there is a significant increase in traffic along the A1067 and some stretches of grass verges, an increase in traffic is unlikely to increase verge erosion due to the distance between the edge of the road and the road verge (only infrequent tracking over verge likely)*.". LO suggested visual checks of verge tracking would be required and included in the proposed Mitigation Measures Action Plan (MMAP).	
1.2	**HAWRAT and mitigation for reducing silt** RD advised HAWRAT is suitable for assessing the impact of routine runoff on SACs (as per guidance) whereby the tool uses differing quality thresholds for contaminants and sediment to 'pass'. HAWRAT considers the impact of pollutants and sediment directly associated with number of road vehicles but not from other sources such as from land runoff or verges. HAWRAT thresholds for contaminants and sediment is relative to EQS required to achieve WFD Good Ecological Status and the tool identifies runoff from the road to pass this level of quality. A question was posed stating 'Is water quality acceptable at the point of discharge?'. Treatment and maintenance considerations needed. LO discussed the maintenance of drainage. Are these able to cope with increase in traffic including HGV's? Reassurance was requested for remedial action where necessary as there are known sources of silt inputs to the river in this area. The draft River Wensum Diffuse Water Pollution Plan may inform this further. LO suggested a watching brief by NCC to monitor silt ingress via the highway drainage systems and instigate remedial action if necessary. **Action: Seek update on progress of the draft River Wensum Diffuse Water Pollution Plan from Hannah Wallace** MB stated the drainage features are not completely clear and that further works to understand the existing drainage systems may need to be completed RD agreed there was some evidence of sediment accumulation at Attlebridge where a small section of road drains to a tributary of the Wensum and this needs to be investigated further. Other discharges to the Wensum directly appear to be acceptable (based on HAWRAT) based on the rivers ability to disperse and dilute concentrations. A survey of the existing drainage systems would be undertaken by NCC to confirm discharge locations. MK stated the gully pots and other systems are maintained on an annual basis unless there is a notable incident (e.g. blockage/flooding/spill), based on correspondence with the Highways team responsible for this area (James Winter). Starting to identify which features need to be emptied more frequently. LO mentioned the need to identify and map all gullies and other drainage features along the A1067 and Weston Hall Road. NCC will commit to review/ monitor / inspect these gullies and	**LO**

	adjust maintenance as required. NT asked if silt can be monitored. JF advised that a system is in place where the maintenance contractor who clear out the gullies can monitor silt removed but simply as a 'present' or 'not present' approach. Quantities cannot be recorded. LO raised her concerns over the need to understand, prior to the opening of the NDR, baseline conditions of quantity of silt entering the Wensum/tributary via the existing drainage system. All agreed a mechanism to measure the depth of silt prior to clearing the gullies out could give an indication of quantities likely to be generated from the road and visual inspections of outfalls to watercourses could identify any sediment accumulation. This would provide reassurance is needed to ensure the justifications for completing the works is correct. LO posed some questions; who will maintain these? How often will these be maintained? Any remedial action? What features are present? (LO stated that photographs could be a good way of monitoring.) These questions should be addressed within the MMAP.	
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Signed:	**Dated:**

09/10/2014~~30/09/2014~~

Record of telephone conversation

Project title	Norwich Northern Distributor Road				
Project no	339156	File no			
Between (for MMG)	Becky Day; Simon Allen & Jackie Fookes	Date	11.09.2014	Time	10:00
And (name)	Martin Barrell & Rob Dryden	Organisation	Environment Agency	Phone no	01473 706043
Subject	NDR HRA – Final agreed approach				

Summary

1. Introductions

Individual introductions made.

The purpose of the meeting was for Rob Dryden (Lead in EA Biodiversity and Fisheries team for the River Wensum) to provide further clarification to points made in the joint EA/NE letter dated 27th August 2014 and to agree to the proposed way forward that was identified during the meeting on 9th Sept 2014 between MM, NCC, EA and NE.

2. Part lining and planting of lagoons

RD summarised the need to improve the existing drainage system to enhance biodiversity as raised in 2005 and again in 2007. The drainage design at that time needed to be improved by creating shallower lagoons with gentler sloping sides, with the provision of planted permanent wet areas.

BD explained the reasons behind not providing planting within the primary lagoon and/or lining and planting parts of the infiltration lagoons:

- The main purpose of the lined primary lagoon is for spillage containment. Creating a bi-functioning lagoon that both creates habitat and encourages wildlife to enter but also to contain a tanker spill would be disingenuous. A major spill resulting in significant loss of ecology (particularly protected species) could have significant legal implications for NCC. The EA felt that if the lined lagoons were planted up we would be enhancing biodiversity – if there was a spill there should be no implications because we were not claiming habitat creation. If we did not plant them up they would likely to be colonised. **JF will check the legality with NE**
- The lined secondary ponds at Lagoon 17, 18 and 18A will be planted with reeds for treatment purposes prior to discharge but with ecological benefits.
- No permanent wet areas can be provided at Lagoons 13 and 13a due to their close proximity to the airport in order to reduce the potential for bird strike.
- Part lining of secondary infiltration lagoons is restricted by a constraint provided by the EA flood management team on half drain down times (based on the guidance within the CIRIA SuDS Manual) – the lagoon should drain by half in less than 48 hours. Lining part of the lagoons would further reduce drain down times and lagoons would need to be enlarged to accommodate the loss of permeable area. Enlarging lagoons now would require additional land take under compulsory purchase which NCC would like to avoid.
- The infiltration lagoons will be seeded with grasses and wildflowers to enhance ecology.

SA noted there were locations where poor drain down times could result in seasonal or permanent wet areas. There may be opportunities in the future to plant up these areas within the infiltration

ponds.

JF raised the issue of cost. The cost of installing additional wet areas simply to enhance biodiversity would need to be justified as this is public money. Public response to DCO application so far suggests the local residents are not interested in ecological mitigation or enhancement. Wetland areas proposed at the Springs in Rackheath are required to mitigate against for areas lost in the locality, making a like for like replacement.

RD requested a formal response to this issue (***Action: BD***). The EA will then respond accordingly.

3. Weston Hall Road – silt trap design and ditch dredging/clearance

From the meeting on 9th Sept it was agreed to install a silt trap along Ditch 2A and Ditch 1B, with the planting of reeds upstream of Culvert 2 (see Figure 3.3 in Addendum to HRA for referenced plan).

The EA letter dated 27th August suggested the silt trap design to be a deepened, widened channel section rather than a weir type structure. This would promote fish passage and reduce impacts on geomorphology. BD noted the presence of sluices up and downstream of this location already providing this type of barrier. BD requested further clarification from RD on silt trap design. RD felt he could not confirm appropriate design without visiting the site and understanding better the hydrological regime of the area. This meeting would also discuss the betterment proposals made within the Addendum e.g. dredging Ditch 1B. ***BD to arrange a site visit on Tues 16th Sept at 11:30am and confirm arrangements with RD.***

RD emphasised the need for any additional sediment entering these ditch systems from the highway to be prevented from reaching the Wensum due to its unfavourable condition.

NCC is keen to progress with the local land owner agreements to ensure NCC have agreements in place to fulfil the mitigation required under the HRA. Once the location and design mitigation measures in this location have been agreed with the EA, NCC would proceed with the local agreements.

4. A1067 – survey of existing structures and further explanation of the last paragraph under 'A1067 at Attlebridge and Lenwade' (letter 27/08/14) regarding additional SuDS.

BD explained what was discussed at the meeting regarding the potential impact of NDR on the Wensum in terms of increased silt in road runoff from (1) increased traffic and (2) increased verge erosion from vehicle tracking. In response to these two issues we have already identified in the HRA Addendum that (1) DMRB HAWRAT (HD45/09) is suitable for assessing the impact of road runoff on SACs and shows in this location that long and short term impacts associated with runoff contaminants meets the EQS under WFD; and (2) verge tracking will not increase as a result of increased traffic due to the distance between the white line along the road and the edge of the grass verge. Only during emergency situations would a car/HGV be required to pull onto the verge.

JF requested further clarification as to why further mitigation was necessary in these locations as suggested in the letter (e.g. new attenuation ponds) to which RD responded to say NCC are required to work with the EA in improving the quality of water entering the Wensum via the highways. JF felt this was not relevant to the HRA where only the impacts of NDR are being considered; rather this is a separate issue to be agreed outside the HRA.

RD raised the requirement to take the "precautionary approach" where the risk was beyond reasonable doubt. As agreed in the meeting on 9th Sept, a survey of the existing drainage structures will be undertaken by NCC to understand fully how runoff is captured, treated and discharged to the Wensum in the Attlebridge and Lenwade locations. Silt present within the gully pots and receiving ditches/watercourse would be monitored and recorded as a baseline condition. Once NDR is constructed further monitoring would ascertain whether improvements to the existing system would be required due to any increase in silt attributed to the increased traffic from the NDR.

BD asked RD what he thought would trigger the need for mitigation based on the silt monitoring results. RD suggested this was something for NCC to decide and present in the Mitigation Measures Action Plan (MMAP) for the EA to review. Any increase in silt to the Wensum would need to be mitigated against.

5. Mitigation management action plan (MMAP)

RD agreed to the proposed framework of the MMAP as discussed at the meeting on 9th Sept.

For the A1067, the MMAP should include the need to define baseline conditions of existing system and visual assessment of verge tracking. Each system feature to be identified in a tabular format with details of proposed maintenance: frequency, responsibility, monitoring, etc. RD requested the open dyke and tributary to the Wensum at Attlebridge to be listed and monitored in this location.

Along Weston Hall Road, the new structures would require similar tabulated information; monitored and maintained to ensure effective removal of silt.

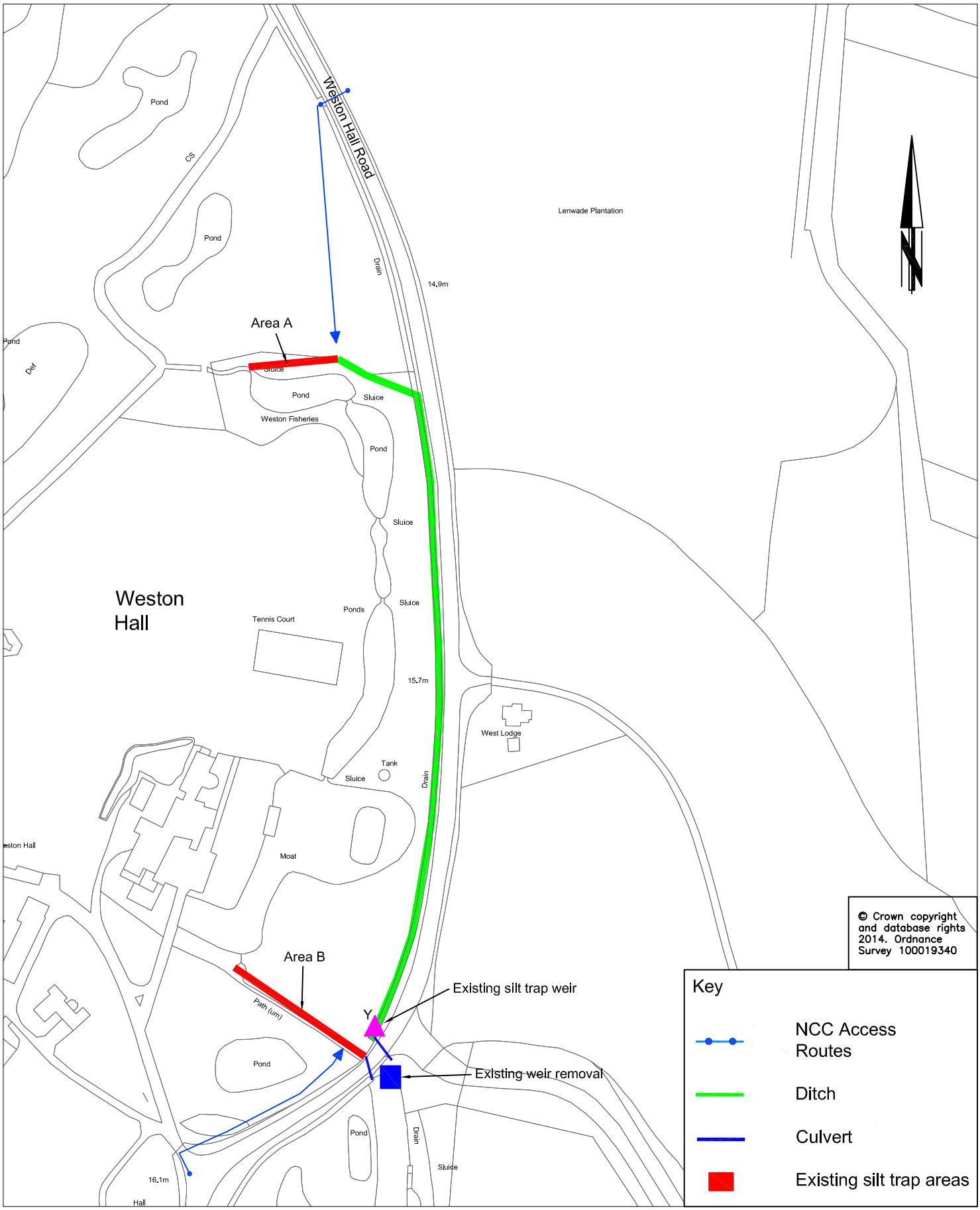
How and by whom monitoring is recorded and reported back to NE/EA should be set out in the plan. This needs to consider 4-5 years in the future (post NDR construction).

The draft River Wensum Diffuse Water Pollution Management Plan to be reviewed once a draft is provided by Louise Oliver (NE) and consideration given to the inclusion of this location within the plan.

JF explained the deadlines agreed:

- Framework of MMAP report to be provided to NE/EA by end of Sept to feed into the 10th Oct deadline for NE response to ExA.
- Draft MMAP report to NE/EA by 13th October.
- Final MMAP agreed by all parties by early November 2014.
- All local agreements, consents, etc. for this element of the work to be in place by July 2015.

Action	To	A	I	C	Sign	Date
SA/JF to speak to NE regarding legal implications for NCC of promoting aquatic habitat within a spillage containment structure.						
BD to arrange access to Weston Hall Estate and Dinosaur Park for BD/RD to agree betterment/mitigation within ditches receiving runoff from Weston Hall Road.						
BD (with Mark Kemp from NCC) to arrange drainage survey of A1067 at Attlebridge and Lenwade to inform MMAP.						
SA/JF/RD to review draft River Wensum Diffuse Water Pollution Management Plan.						
Return to						



Norfolk

Mott MacDonald

Birse Civils

DRAWING TITLE

Norwich Northern Distributor Road
Weston Hall Estate Limited
Drainage Improvements

Tom McCabe
Interim Director of Environment,
Transport and Development
Norfolk County Council
County Hall
Martineau Lane
Norwich NR1 2SG

REV.	DESCRIPTION	CHECKED	DATE
	DRAFT		

	INIT.	DATE
SURVEYED BY	OS	2014
DESIGNED BY	JC	07/14
DRAWN BY	JC	07/14
CHECKED BY		

DRAWING No. R1C093-R1-4807

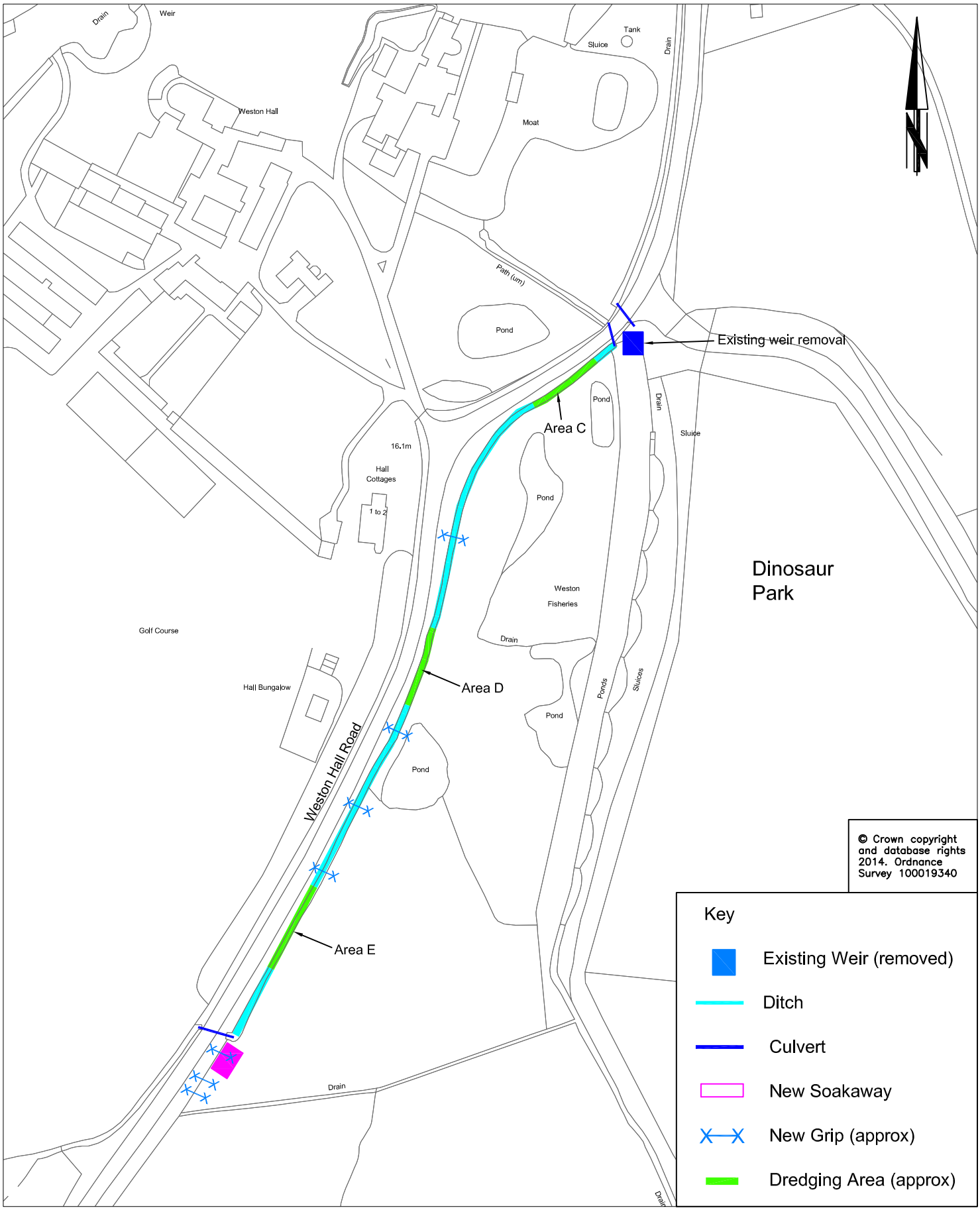
PROJECT TITLE Norwich Northern Distributor Road

SCALE 1:1500

FILE No. R1C093

ORIGINAL SIZE: A3

BIL 28/10/13



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PROJECT TITLE Norwich Northern Distributor Road
SCALE 1:1500
FILE No. R1C093

ORIGINAL SIZE: A3

BIL 28/10/13

Nichols, Jonathan D

From: Day, Rebecca
Sent: 01 October 2014 10:52
To: John Hiskett (JohnH@norfolkwildlifetrust.org.uk)
Subject: Weston Hall Road - Drainage improvement plans
Attachments: R1C093-R1-4807 4808 Weston Hall Road Estate Plans_For comment.pdf; 1345 Weston Meadow CWS

Dear John

Jackie Fookes has given me your details as someone who might provide comment on our plans to carry out works alongside one of your County Wildlife Sites (CWS), namely Weston Meadow CWS (see attached email from your colleague Emily).

A site visit was undertaken with the Environment Agency to determine what mitigation or maintenance measures could be put in place to prevent any increase in silt entering the River Wensum SAC via road runoff as a result of NDR and the new Link Road, which will increase traffic along Weston Hall Road. The main focus was to avoid putting any new structures within the watercourses in order to maintain continuity upstream e.g. for fish and lamprey migration.

The mitigation proposed is in an area along the boundary of the CWS as shown on drawing R1C093-R1-4808 attached.

The plan is to remove existing wooden sluice upstream of Culvert 1 as it appears to serve no purpose. The culvert removal would need to be preceded by silt removal in a short section of Ditch 1B upstream of the culvert in order to prevent a pulse of sediment passing downstream. The long term measures in this area is to dredge and continue to maintain small intermittent sections along Ditch 1B to act as online silt traps, marked as approximate Areas C-E on Drawing ref R1C093-R1-4808 attached. It was agreed that there was little benefit in comprehensive desilting of this watercourse since this would have the consequence of improving the transport of sediment downstream to the River Wensum, the very thing we are trying to avoid. Tree cover and vegetation to remain in undisturbed sections to continue to act as a silt trap. Periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

The planting of reeds upstream of Ditch 2B was considered ineffective as the overshadow of the trees would make it difficult to establish good growth. In addition, the alder woodland is of existing conservation interest and therefore should not be felled to make way for reed.

Consideration of silt disposal will be given where the invasive Himalayan Balsam (and seeds) is present.

We are also looking at the potential for local storage of water/silt in the seasonal ditch system on the east side of the road just upstream of Culvert 3 to capture and divert flows coming down the hill from the south before it enters Ditch 1B and 2A. A small section of ditch remains dry on the eastern side of the road due to the diversion of previous ditch and installation of Culvert 3 (located southwards of Culvert 3), marked as a potential 'New Soakaway' on Drawing ref R1C093-R1-4808 attached. The dry ditch in this location could act as a soakaway with new grips directing flows from the south into here reducing volume of runoff reaching Ditch 1B and 2A. Some hedge and tree clearance required and construction of new grips through highway verge. This could be maintained by NCC maintenance team.

We welcome your comments on these plans. We are under a lot of pressure to get these measures agreed as part of the HRA sign off. Could I therefore ask for comments to be sent by **CoP Friday 3rd October**. I know this is a quick turnaround time but we are keen to agree these measures as soon as possible.

Please call if you would like to discuss these measures further.

Kind regards,

Rebecca

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
CEnv
Environmental Scientist

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Cambridge CB1 2RS	**F**	+44 (0)1223 461007
United Kingdom	**W**	www.environment.mottmac.com

Normal working days: Tues, Wed, Thurs.
(Thursdays working from home)

From: Hearsum, Ian J
Sent: 25 September 2014 17:01
To: Day, Rebecca
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Rebecca,

Please see attached draft of the mark-ups. They have taken an hour and a half so far.

Kind Regards

Ian Hearsum

External Lighting Technician

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1st Floor
69-75 Thorpe Road
Norwich
NR1 1UA
United Kingdom

T +44 (0)1603 226731

W www.mottmac.com

From: Day, Rebecca
Sent: 25 September 2014 09:25
To: Worsley, Alastair
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Alistair

Thanks for sorting this.

Could a draft be prepared by the end of today?

Other minor amendments to the plans may follow early next week following consultation.

Many thanks
Becky

From: Worsley, Alastair
Sent: 25 September 2014 08:34
To: Day, Rebecca
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Becky,

I've handed this over to Ian Hearsum in our office who will be able to crack on with this almost right away. When do you need this all completed by?

Thanks

A

From: Day, Rebecca
Sent: 24 September 2014 15:39
To: Worsley, Alastair
Cc: Fookes, Jacqueline E
Subject: Weston Hall Road - Drainage improvement plans

Alastair

Apologies for the delay in sending this through. I had a fight with the new scanner!

Please could you arrange for drawings 4807 and 4808 to be updated as shown on the PDF provided in the following folder:
<File:\\UKCAMBVMADC03\Projects\Norwich\MM Projects\339156 - NDR Environmental Support 2014\CAD\HRA local agreement plans>
The CAD file is also available here.

If you, or the person undertaking the drawing changes, have any questions then please give me a call!

Thanks
Becky

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
CEnv
Environmental Scientist

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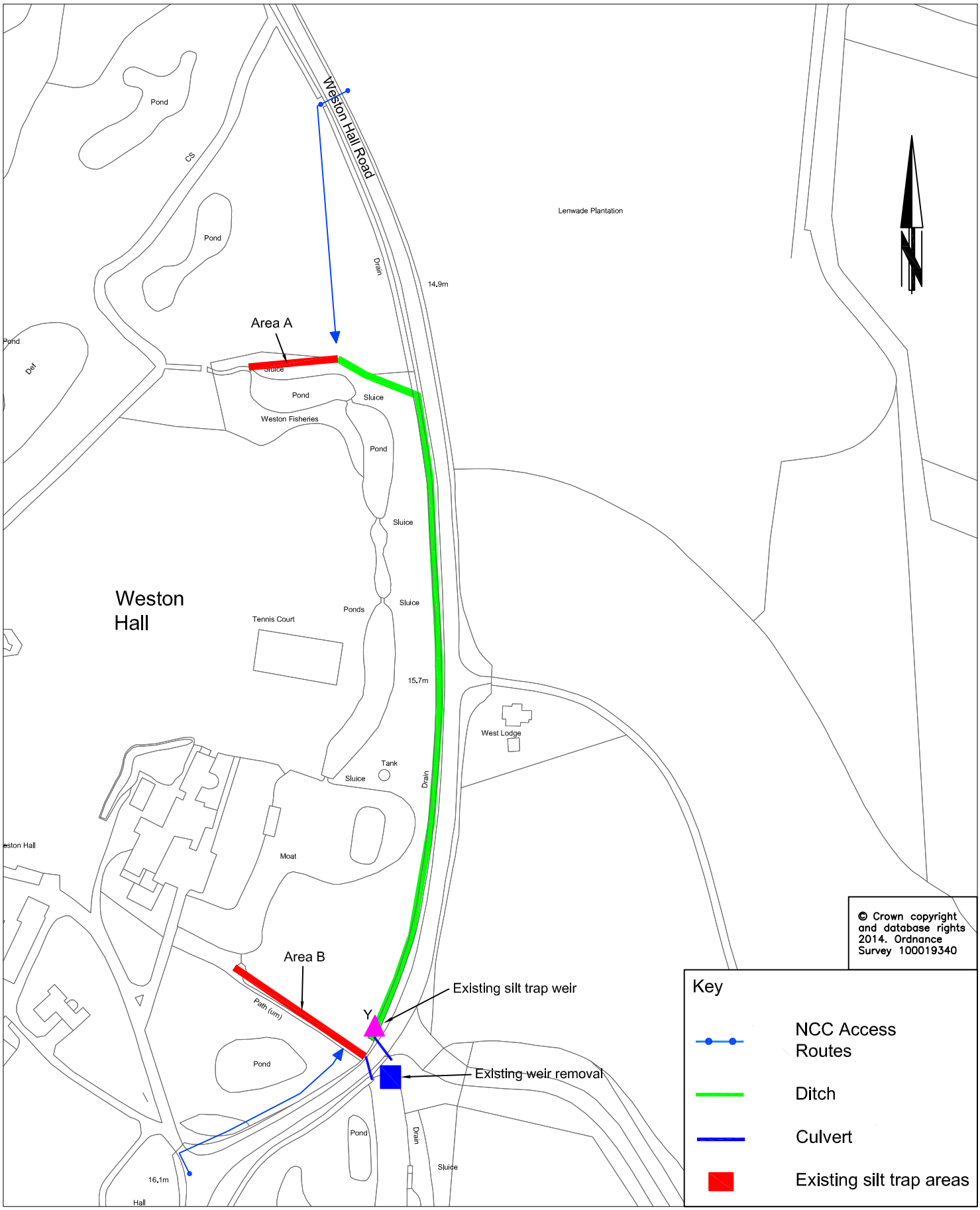

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DRAWING No. R1C093-R1-4807

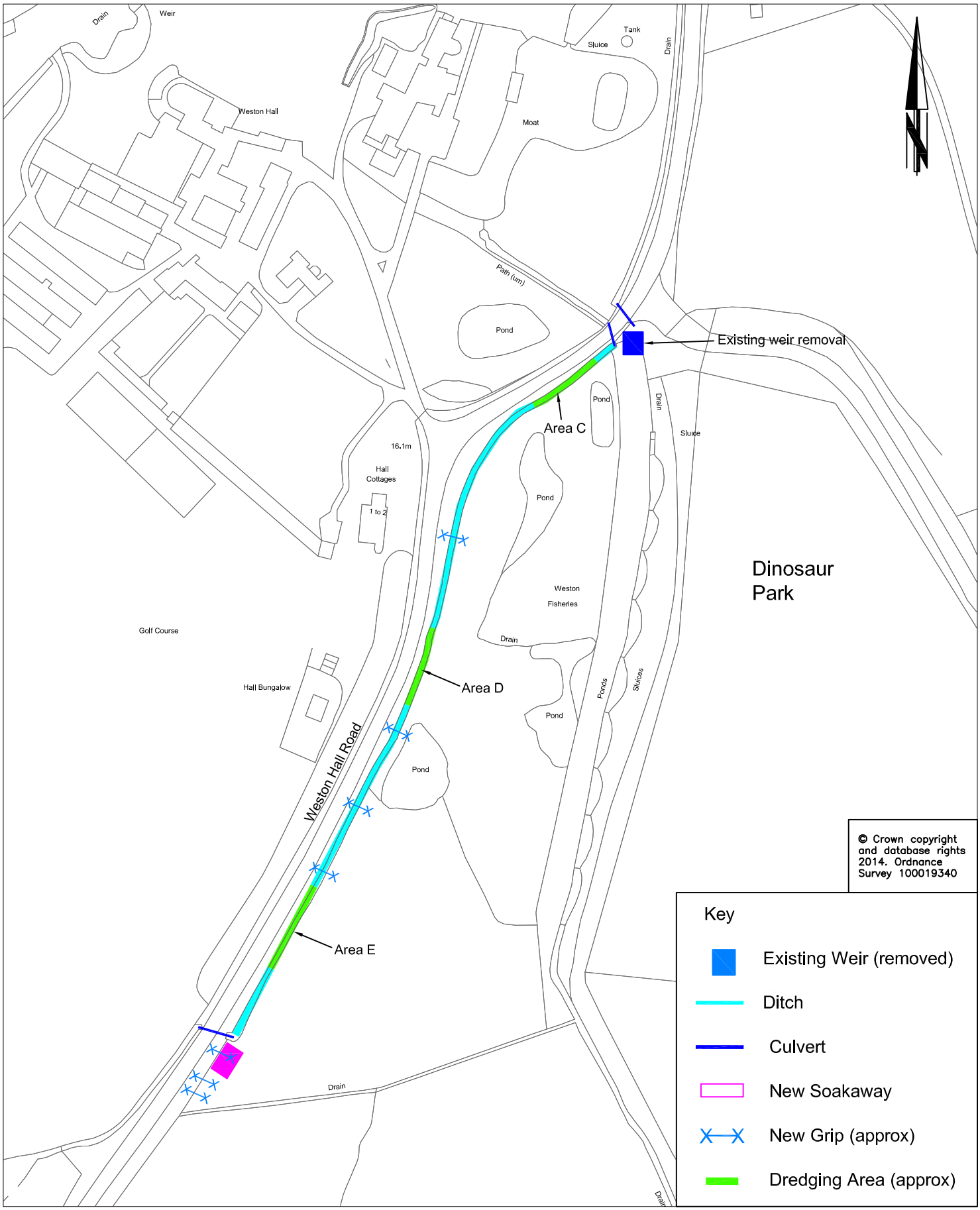
PROJECT TITLE Norwich Northern Distributor Road

SCALE 1:1500

FILE No. R1C093

ORIGINAL SIZE: A3

BIL 28/10/13



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DRAWING No. R1C093-R1-4808
PROJECT TITLE Norwich Northern Distributor Road
SCALE 1:1500
FILE No. R1C093

ORIGINAL SIZE: A3

BIL 28/10/13

Nichols, Jonathan D

From: planning <planning@norfolkwildlifetrust.org.uk>
Sent: 18 September 2014 13:33
To: Day, Rebecca
Cc: John Hiskett
Subject: 1345 Weston Meadow CWS
Attachments: 1345.doc; 1345 Weston Meadow (MottMac).pdf

Dear Rebecca,

Thank you for your call earlier today, if the Northern Distributor works you are planning impact CWS 1345 Weston Meadow, Norfolk Wildlife Trust would definitely like to be consulted regarding the proposed works.

Please find attached the citation for this site. Plus I quickly pulled together a GIS map of the site too, as the citation map is really poor.

Thanks,

Best wishes,

Emily

planning

Norfolk Wildlife Trust
Office: **01603 625540**
Fax: **01603 598300**
Web: www.norfolkwildlifetrust.org.uk

Thank you! £2.6 million raised for our vision for Cley and Salthouse: A Living coast

County Wildlife Site
(Ref No: 1345)

Site Name: Weston Meadow **Parish: Weston Longville**

Grid Reference: TG 102172 **Area: 5.0 ha**

Site Description:*

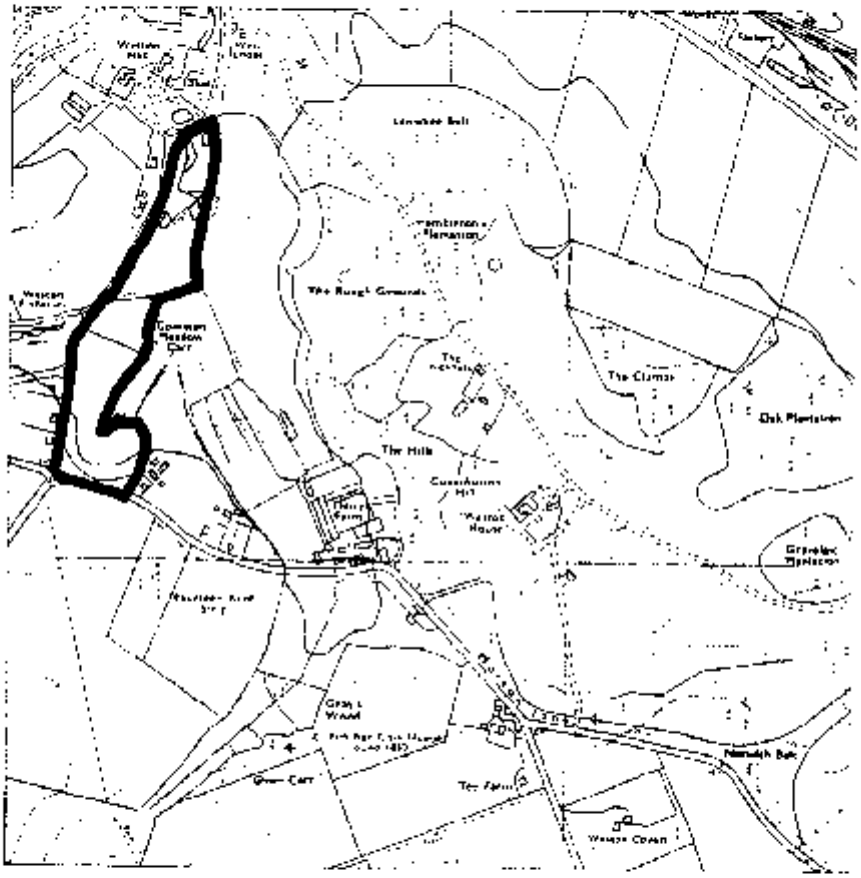
This site is an area of lowland marshy grassland bisected by a ditch.

North of the ditch is typical tall herb with pond-sedge (*Carex* spp.), nettle (*Urtica dioica*) great willowherb (*Epilobium hirsutum*) and meadowsweet (*Filipendula ulmaria*) and marsh thistle (*Cirsium palustre*).

The southern end has been cattle grazed and appears more diverse with species typical of grazing marshes occurring including common spotted-orchid (*Dactylorhiza fuchsii*), blunt flowered-rush (*Juncus subnodulosus*) and marsh-marigold (*Caltha palustre*).

*****Based on the Wensum Valley Project 1993 Survey.

Survey date: 10/07/1993



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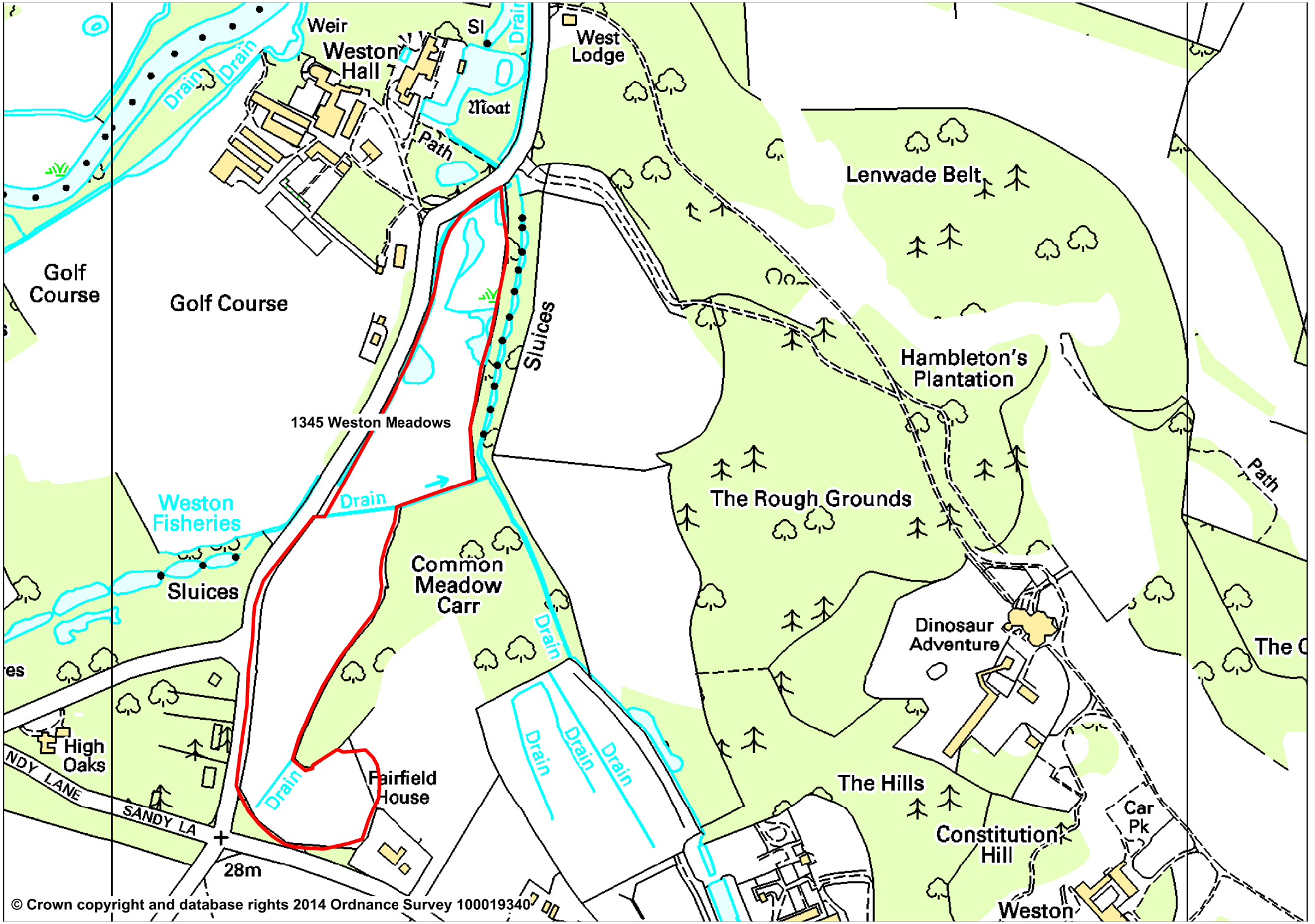
Norfolk County Council
County Hall
Norwich Date .....

Survey date: 10/07/1993


Weir
Weston Hall
Sl
Drain
West Lodge
Moat
Path
Drain
Drain
Lenwade Belt
Golf Course
Golf Course
Sluices
Hambleton's Plantation
1345 Weston Meadows
Drain
Weston Fisheries
The Rough Grounds
Path
Sluices
Common Meadow Carr
Drain
Dinosaur Adventure
The
High Oaks
Drain
Drain
Drain
Drain
Fairfield House
The Hills
Car Pk
SANDY LANE
SANDY LA
28m
Constitution Hill
Weston
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Nichols, Jonathan D

From: Oliver, Louise (NE) <Louise.Oliver@naturalengland.org.uk>
Sent: 01 October 2014 15:39
To: Day, Rebecca; Tribe, Nick (NE)
Cc: Fookes, Jacqueline E; martin.barrell@environment-agency.gov.uk; rob.dryden@environment-agency.gov.uk
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Rebecca,

Further to your email, I'm happy with the final minutes of the meeting held on 9 September.

In relation to the four mitigation areas identified during the Weston Hall Road site visit, I will defer comment to Rob Dryden as I was not present at that meeting.

Regards,

Louise

Louise Oliver
Lead Adviser – Norfolk & Suffolk Team
Natural England
Dragonfly House, 2 Gilders Way
Norwich, NR3 1UB
T: 0300 060 1981 M: 07920 086653
Please note I work part-time Monday to Wednesday inc, usually between 8 am – 4 pm
www.naturalengland.org.uk

From: Day, Rebecca [mailto:Rebecca.Day@mottmac.com]
Sent: 30 September 2014 15:44
To: martin.barrell@environment-agency.gov.uk; wojtek.koryczan@environment-agency.gov.uk; Tribe, Nick (NE); Oliver, Louise (NE); rob.dryden@environment-agency.gov.uk
Cc: Kemp, Mark; Kurek, Marcin; Fookes, Jacqueline E
Subject: Weston Hall Road - Drainage improvement plans

All

Thank you, Louise, for your comments on the meeting minutes. I have made just one final change to the text. Hopefully we are all now in agreement with the attached final versions of the meeting/telecon minutes.

Further to the Weston Hall Road site visit, myself, Rob Dryden and Adam Thurtle (EA project manager for River Wensum Strategy) discussed the following improvements and maintenance to the Weston Hall Road drainage to prevent any additional silt associated with the increased traffic from entering the River Wensum. The main focus was to avoid putting any new structures within the watercourses in order to maintain continuity upstream e.g. for fish and lamprey migration. The four areas for mitigation are as follows:

Mitigation Areas 1 & 2

Ditch 2A, running parallel to Weston Hall Road, is quite small and has a reasonable gradient. As a result, fine sediment (sand, silt and clay) is transported through the system leaving a relatively clean gravel bed. This section is likely to be of ecological value. It was agreed that putting any structure here would adversely affect the longitudinal connectivity of the watercourse. In addition, the potential for silt storage/capture is quite limited.

There are two natural silt traps (or sinks) present where the existing channel widens, dissipating flow energy and resulting in deposition of suspended sediment. The proposed measures are to (1) carry out initial and periodic dredging of an existing natural silt trap present downstream of Culvert 1 (Area B on Drawing Ref R1C093-R1-4807 attached); and (2) Initial and periodic dredging of an existing natural silt trap present downstream of where Ditch 2A flows westwards at its northern extent (Area A on Drawing Ref R1C093-R1-4807 attached). Access to these areas is restricted and may need undertaking by the landowner. Periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Mitigation Area 3

The plan is to remove existing wooden sluice upstream of Culvert 1 as appears to serve no purpose. The culvert removal would need to be preceded by silt removal in a short section of Ditch 1B upstream of the culvert in order to prevent a pulse of sediment passing downstream. The long term measures in this area is to dredge and continue to maintain small intermittent sections along Ditch 1B to act as online silt traps, marked as approximate Areas C-E on Drawing ref R1C093-R1-4808 attached. It was agreed that there was little benefit in comprehensive desilting of this watercourse since this would have the consequence of improving the transport of sediment downstream to the River Wensum, the very thing we are trying to avoid. Tree cover and vegetation to remain in undisturbed sections to continue to act as a silt trap.

The planting of reeds upstream of Ditch 2B was considered ineffective as the overshadow of the trees would make it difficult to establish good growth. In addition, the alder woodland is of existing conservation interest and therefore should not be felled to make way for reed.

Consideration of silt disposal will be given where the invasive Himalayan Balsam (and seeds) is present.

Similar to Areas 1 and 2, periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Mitigation Area 4

We looked at the potential for local storage of water/silt in the seasonal ditch system on the east side of the road just upstream of Culvert 3 to capture and divert flows coming down the hill from the south before it enters Ditch 1B and 2A. A small section of ditch remains dry on the eastern side of the road due to the diversion of previous ditch and installation of Culvert 3 (located southwards of Culvert 3), marked as a potential 'New Soakaway' on Drawing ref R1C093-R1-4808 attached. The dry ditch in this location could act as a soakaway with new grips directing flows from the south into here reducing volume of runoff reaching Ditch 1B and 2A. Some hedge and tree clearance required and construction of new grips through highway verge.

Areas 3 and 4 could be maintained by NCC maintenance team.

How each area is managed and maintained will be set out in the Mitigation Measures Action Plan, including the consideration of protected species and measures to prevent silt being transported downstream during dredging works.

We welcome your comments on these plans. We are under a lot of pressure to get these measures agreed as part of the HRA sign off. Could I therefore ask for all comments to be sent by **CoP Thursday 2nd October**. I know this is a quick turnaround time but we are keen to agree these measures as soon as possible.

Kind regards

Rebecca

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
CEnv
Environmental Scientist

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Sent: 25 September 2014 17:01
To: Day, Rebecca
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Rebecca,

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Kind Regards

Ian Hearsum

External Lighting Technician

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1st Floor
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United Kingdom

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W www.mottmac.com

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Sent: 25 September 2014 09:25
To: Worsley, Alastair
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

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Many thanks
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Sent: 25 September 2014 08:34
To: Day, Rebecca
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

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Thanks

A

From: Day, Rebecca
Sent: 24 September 2014 15:39
To: Worsley, Alastair
Cc: Fookes, Jacqueline E
Subject: Weston Hall Road - Drainage improvement plans

Alastair

Apologies for the delay in sending this through. I had a fight with the new scanner!

Please could you arrange for drawings 4807 and 4808 to be updated as shown on the PDF provided in the following folder:
<File:\\UKCAMBVMADC03\Projects\Norwich\MM Projects\339156 - NDR Environmental Support 2014\CAD\HRA local agreement plans>
The CAD file is also available here.

If you, or the person undertaking the drawing changes, have any questions then please give me a call!

Thanks
Becky

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
CEnv
Environmental Scientist

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(Thursdays working from home)

Nichols, Jonathan D

From: Dryden, Rob <rob.dryden@environment-agency.gov.uk>
Sent: 02 October 2014 12:13
To: Day, Rebecca
Cc: Barrell, Martin; Oliver, Louise (NE)
Subject: RE: Weston Hall Road - Drainage improvement plans

Dear Rebecca,

Thanks for sending through these revised mitigation proposals for Weston Hall Road.

If implemented as described they should help reduce the volume of silt that is entering the Wensum from the road. This will help mitigate for any increase in the supply of sediment and other pollutants as a result of predicted traffic increases that would result from construction of the proposed Norwich Northern Distributor Road.

We think that these measures reflect what can be reasonably achieved given that the option of separating out the road drainage from the general surface water drainage network has been rejected at this stage. We look forward to the measures being incorporated into the Mitigation Measures Action Plan.

We draw your attention to two specific points. First, for Mitigation Area 3, we discussed the possibility of removing the dropboard structure **downstream of Culvert 2.** There are no structures on this watercourse (Ditch 2a) between this point and the Wensum, and so its removal would benefit the longitudinal continuity of the watercourse. This action would need to be accompanied by a once only silt removal from a short section of Ditch 2B. Could these measures be incorporated into the Mitigation Measures Action Plan? You have suggested the removal of the small structure upstream of Culvert 1, together with localised silt removal, which we would also support.

Second, we have previously encouraged NCC to think about options to contain and manage run-off closer to source (i.e. on the road network higher up the valley sides). Although you have made no specific recommendations to address this issue, this should be borne in mind for the future if the proposed monitoring programme indicates that additional mitigation measures need to be implemented.

Regards,

Rob Dryden

Dr Rob Dryden
Technical Specialist, Fisheries and Biodiversity Team
Environment Agency, Essex, Norfolk and Suffolk

From: Day, Rebecca [mailto:Rebecca.Day@mottmac.com]
Sent: 30 September 2014 15:44
To: Barrell, Martin; Koryczan, Wojtek; nick.tribe@naturalengland.org.uk; louise.oliver@naturalengland.org.uk; Dryden, Rob
Cc: Kemp, Mark; Kurek, Marcin; Fookes, Jacqueline E
Subject: Weston Hall Road - Drainage improvement plans

All

Thank you, Louise, for your comments on the meeting minutes. I have made just one final change to the text. Hopefully we are all now in agreement with the attached final versions of the meeting/telecon minutes.

Further to the Weston Hall Road site visit, myself, Rob Dryden and Adam Thurtle (EA project manager for River Wensum Strategy) discussed the following improvements and maintenance to the Weston Hall Road drainage to prevent any additional silt associated with the increased traffic from entering the River Wensum. The main focus was to avoid putting any new structures within the watercourses in order to maintain continuity upstream e.g. for fish and lamprey migration. The four areas for mitigation are as follows:

Mitigation Areas 1 & 2

Ditch 2A, running parallel to Weston Hall Road, is quite small and has a reasonable gradient. As a result, fine sediment (sand, silt and clay) is transported through the system leaving a relatively clean gravel bed. This section is likely to be of ecological value. It was agreed that putting any structure here would adversely affect the longitudinal connectivity of the watercourse. In addition, the potential for silt storage/capture is quite limited.

There are two natural silt traps (or sinks) present where the existing channel widens, dissipating flow energy and resulting in deposition of suspended sediment. The proposed measures are to (1) carry out initial and periodic dredging of an existing natural silt trap present downstream of Culvert 1 (Area B on Drawing Ref R1C093-R1-4807 attached); and (2) Initial and periodic dredging of an existing natural silt trap present downstream of where Ditch 2A flows westwards at its northern extent (Area A on Drawing Ref R1C093-R1-4807 attached). Access to these areas is restricted and may need undertaking by the landowner. Periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Mitigation Area 3

The plan is to remove existing wooden sluice upstream of Culvert 1 as appears to serve no purpose. The culvert removal would need to be preceded by silt removal in a short section of Ditch 1B upstream of the culvert in order to prevent a pulse of sediment passing downstream. The long term measures in this area is to dredge and continue to maintain small intermittent sections along Ditch 1B to act as online silt traps, marked as approximate Areas C-E on Drawing ref R1C093-R1-4808 attached. It was agreed that there was little benefit in comprehensive desilting of this watercourse since this would have the consequence of improving the transport of sediment downstream to the River Wensum, the very thing we are trying to avoid. Tree cover and vegetation to remain in undisturbed sections to continue to act as a silt trap.

The planting of reeds upstream of Ditch 2B was considered ineffective as the overshadow of the trees would make it difficult to establish good growth. In addition, the alder woodland is of existing conservation interest and therefore should not be felled to make way for reed.

Consideration of silt disposal will be given where the invasive Himalayan Balsam (and seeds) is present.

Similar to Areas 1 and 2, periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

Mitigation Area 4

We looked at the potential for local storage of water/silt in the seasonal ditch system on the east side of the road just upstream of Culvert 3 to capture and divert flows coming down the hill from the south before it enters Ditch 1B and 2A. A small section of ditch remains dry on the eastern side of the road due to the diversion of previous ditch and installation of Culvert 3 (located southwards of Culvert 3), marked as a potential 'New Soakaway' on Drawing ref R1C093-R1-4808 attached. The dry ditch in this location could act as a soakaway with new grips directing flows from the south into here reducing volume of runoff reaching Ditch 1B and 2A. Some hedge and tree clearance required and construction of new grips through highway verge.

Areas 3 and 4 could be maintained by NCC maintenance team.

How each area is managed and maintained will be set out in the Mitigation Measures Action Plan, including the consideration of protected species and measures to prevent silt being transported downstream during dredging works.

We welcome your comments on these plans. We are under a lot of pressure to get these measures agreed as part of the HRA sign off. Could I therefore ask for all comments to be sent by **CoP Thursday 2nd October**. I know this is a quick turnaround time but we are keen to agree these measures as soon as possible.

Kind regards

Rebecca

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
CEnv
Environmental Scientist

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From: Hearsum, Ian J
Sent: 25 September 2014 17:01
To: Day, Rebecca
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Rebecca,

Please see attached draft of the mark-ups. They have taken an hour and a half so far.

Kind Regards

Ian Hearsum

External Lighting Technician

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69-75 Thorpe Road
Norwich
NR1 1UA
United Kingdom

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W www.mottmac.com

From: Day, Rebecca
Sent: 25 September 2014 09:25
To: Worsley, Alastair
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Alistair

Thanks for sorting this.

Could a draft be prepared by the end of today?

Other minor amendments to the plans may follow early next week following consultation.

Many thanks
Becky

From: Worsley, Alastair
Sent: 25 September 2014 08:34
To: Day, Rebecca
Cc: Fookes, Jacqueline E; Hearsum, Ian J
Subject: RE: Weston Hall Road - Drainage improvement plans

Hi Becky,

I've handed this over to Ian Hearsum in our office who will be able to crack on with this almost right away. When do you need this all completed by?

Thanks

A

From: Day, Rebecca
Sent: 24 September 2014 15:39
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Alastair

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error, please contact the sender and delete the material from any computer.

Please consider the environment before printing this e-mail or its attachments

Nichols, Jonathan D

From: John Hiskett <JohnH@norfolkwildlifetrust.org.uk>
Sent: 03 October 2014 11:53
To: Day, Rebecca
Subject: RE: Weston Hall Road - Drainage improvement plans

Dear Rebecca

Thank you for consulting NWT, regarding this work. We haven't visited the site since 2008 and at the time the northern part of the CWS, where these works are due to take place, was grazed and was assessed as being in reasonable condition. I was however, able to see the site from the road yesterday. From the description in your email, we do not have any concerns, in principle, regarding the drainage improvement works. We would however, request that working practices are such that damage to the adjacent areas of the CWS are kept to a minimum.

Regards

John Hiskett
Senior Conservation Officer

John Hiskett CEnv MIEEM
Senior Conservation Officer

Office: **01603 625540**
Fax: **01603 598300**
Web: www.norfolkwildlifetrust.org.uk

Thank you! £2.6 million raised for our vision for Cley and Salthouse: A Living coast

---

From: Day, Rebecca [mailto:]
Sent: 01 October 2014 10:52
To: John Hiskett
Subject: **SPAM** Weston Hall Road - Drainage improvement plans

Dear John

Jackie Fookes has given me your details as someone who might provide comment on our plans to carry out works alongside one of your County Wildlife Sites (CWS), namely Weston Meadow CWS (see attached email from your colleague Emily).

A site visit was undertaken with the Environment Agency to determine what mitigation or maintenance measures could be put in place to prevent any increase in silt entering the River Wensum SAC via road runoff as a result of NDR and the new Link Road, which will increase traffic along Weston Hall Road. The main focus was to avoid putting any new structures within the watercourses in order to maintain continuity upstream e.g. for fish and lamprey migration.

The mitigation proposed is in an area along the boundary of the CWS as shown on drawing R1C093-R1-4808 attached.

The plan is to remove existing wooden sluice upstream of Culvert 1 as it appears to serve no purpose. The culvert removal would need to be preceded by silt removal in a short section of Ditch 1B upstream of the culvert in order to prevent a pulse of sediment passing downstream. The long term measures in this area is to dredge and continue to maintain small intermittent sections along Ditch 1B to act as online silt traps, marked as approximate Areas C-E on Drawing ref R1C093-R1-4808 attached. It was agreed that there was little benefit in comprehensive desilting of this watercourse since this would have the consequence of improving the transport of sediment downstream to the River Wensum, the very thing we are trying to avoid. Tree cover and vegetation to remain in undisturbed sections to continue to act as a silt trap. Periodic removal of accumulated silt from this stretch of watercourse will help remove sediment (sand, silt and clay) before it reaches the Wensum.

The planting of reeds upstream of Ditch 2B was considered ineffective as the overshadow of the trees would make it difficult to establish good growth. In addition, the alder woodland is of existing conservation interest and therefore should not be felled to make way for reed.

Consideration of silt disposal will be given where the invasive Himalayan Balsam (and seeds) is present.

We are also looking at the potential for local storage of water/silt in the seasonal ditch system on the east side of the road just upstream of Culvert 3 to capture and divert flows coming down the hill from the south before it enters Ditch 1B and 2A. A small section of ditch remains dry on the eastern side of the road due to the diversion of previous ditch and installation of Culvert 3 (located southwards of Culvert 3), marked as a potential 'New Soakaway' on Drawing ref R1C093-R1-4808 attached. The dry ditch in this location could act as a soakaway with new grips directing flows from the south into here reducing volume of runoff reaching Ditch 1B and 2A. Some hedge and tree clearance required and construction of new grips through highway verge. This could be maintained by NCC maintenance team.

We welcome your comments on these plans. We are under a lot of pressure to get these measures agreed as part of the HRA sign off. Could I therefore ask for comments to be sent by **CoP Friday 3rd October**. I know this is a quick turnaround time but we are keen to agree these measures as soon as possible.

Please call if you would like to discuss these measures further.

Kind regards,

Rebecca

Rebecca Day
BSc (Hons) MSc (Hons), C.WEM,
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Environmental Scientist

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Nichols, Jonathan D

From: Tribe, Nick (NE) <Nick.Tribe@naturalengland.org.uk>
Sent: 07 October 2014 16:24
To: Fookes, Jacqueline E
Cc: Oliver, Louise (NE); Day, Rebecca
Subject: RE: CEMP and LEMP - timelines

Hi Jackie

Just tried to phone – you replied but my mobile signal was weak so I don't think you could hear me.

Louise and I are happy with the outline MMAP – the headers are clear and we only have one query (on landowners consultation) that Louise is sending to Rebecca.

I have drafted a letter outline stating that we are making good progress towards advising 'no likely significant effect' on the Wensum SAC. The letter will also cover the licence progress which I've been chasing up with licensing colleagues.

I'll share the draft with you tomorrow before I send it to PINS.

We are going to have to see a draft MMAP that we are broadly happy with before we can advise 'no likely significant effect'. The deadline for the RIES to be published is Friday 17th and you mentioned that you were planning to work on it today. We had discussed a deadline of the 23rd for the MMAP at the meeting of the 9th September. Could that be brought forward to next week so we can see at least the essentials of the MMAP?

Shall we discuss tomorrow morning?

Thanks

Nick

From: Fookes, Jacqueline E [mailto:Jacqueline.Fookes@mottmac.com]
Sent: 07 October 2014 15:31
To: Tribe, Nick (NE)
Cc: Oliver, Louise (NE); Allen, Simon C
Subject: RE: CEMP and LEMP - timelines

Nick
We are updating the CEMP for sending to the ExA tomorrow. The LEMP is as it stands for the time being.
Cheers
Jackie

Jacqueline Fookes
MSc BSc (Hons)
Senior Environmental Planner

Mott MacDonald

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T +44 (0)1603 226780 (Sbd)
M 07748506310
E jacqueline.fookes@mottmac.com
W www.mottmac.com

From: Tribe, Nick (NE) [mailto:Nick.Tribe@naturalengland.org.uk]
Sent: 07 October 2014 14:24
To: Fookes, Jacqueline E
Cc: Oliver, Louise (NE)
Subject: CEMP and LEMP - timelines

Hi Jackie

Louise and I were wondering what the likely timelines were for any updates to the CEMP (if there are any) and the draft Landscape and Ecology Management Plan?

Thanks

Nick

Nick Tribe

Senior Adviser - Transport

Sustainable Development Team

Natural England

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Lincoln, LN2 4DT

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We are here to secure a healthy natural environment for people to enjoy, where wildlife is protected and England's traditional landscapes are safeguarded for future generations.

In an effort to reduce Natural England's carbon footprint, I will, wherever possible, avoid travelling to meetings and attend via audio, video or web conferencing.

0800 5285280 - landline number for teleconference

02079790003 - mobile number for teleconference

1980630 My access code

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Nichols, Jonathan D

From: Oliver, Louise (NE) <Louise.Oliver@naturalengland.org.uk>
Sent: 07 October 2014 16:50
To: Day, Rebecca
Cc: Tribe, Nick (NE); Fookes, Jacqueline E
Subject: MMAP

Hi Rebecca,

Thanks for sending me a copy of the framework.

The details of other 3rd landowners involved will need to be included in Appendix C, at least in outline.

Regards,

Louise

Louise Oliver

Lead Adviser – Norfolk & Suffolk Team

Natural England

Dragonfly House, 2 Gilders Way

Norwich, NR3 1UB

T: 0300 060 1981 M: 07920 086653

Please note I work part-time Monday to Wednesday inc, usually between 8 am – 4 pm

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Nichols, Jonathan D

From: Tribe, Nick (NE) <Nick.Tribe@naturalengland.org.uk>
Sent: 09 October 2014 10:31
To: Fookes, Jacqueline E
Cc: Oliver, Louise (NE); Dalglish, Gareth (NE)
Subject: NDR advice summary

Hi Jackie

I've discussed this with colleagues including Gareth Dalglish from the Norfolk and Suffolk Area Management Team.

River Wensum SAC

Natural England anticipates being able to advise 'no adverse effect on site integrity' when PINS consults on the Report on Impact on European Sites (RIES) on 17 October. Our advice will be based on the following:

The mitigation for Weston Hall Road is that stated in the email of 30th September (Rebecca Day) and the Addendum to the Habitats Regulations Assessment (July 2014);

The monitoring and mitigation for the A1067 at Attlebridge and Lenwade is that agreed at the meeting of 9 September;

The Mitigation Measures Action Plan (MMAP) will, i) follow the structure of the outline MMAP (NE has agreed that it is happy with the outline MMAP structure (7 October)), and ii) an advanced draft is available for consultation before the closure of the consultation of the RIES period (we expect this will be a 21 day consultation);

We understand that the relevant land owners/managers that may be impacted upon by the MMAP have not all been consulted on the latest version of the plans, although at Weston Hall Road the land owners/managers had agreed in principle to the earlier version of the works proposed in the Habitats Regulations Addendum and one has agreed in principle to the latest plans. We understand that legal agreements are being actively sought with all of the landowners and we are keen to see them finalised. The works could be carried out under Section 100 of the Highways Act 1980 if necessary. The mitigation plan for Weston Hall Road is well understood whereas the mitigation plan for the A1067 can only be fully agreed once the NDR is open and impacts from traffic are understood. If the Examining Authority requires more advice from Natural England on this matter then we will be happy to provide it.

In summary, most of the necessary information has been agreed, the main exception being the landowner agreements and that all available information will be brought together in the MMAP.

River Wensum SSSI

Our advice on the SAC is effective for the SSSI advice also.

I hope that this clarifies our advice and allows you to provide advice to the Examining Authority for their RIES.

EPS licences

My licensing colleagues have received both licenses. They are aware that the deadline for final information to the Examining Authority is 10t November and are working to provide response before that date. If you have any queries on this, please get in touch.

Thanks

Nick

Nick Tribe

Senior Adviser - Transport

Sustainable Development Team

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Appendix B. Site survey plans, notes and photographs

B.1. Traffic data and sediment ingress points

Site 1: B1147 Dereham Road	
2,344	2,999
2,297 (-2%)	**2,876 (-4.1%)**

Site 2: Mill Street	
No data available	

Site 3: Lyng Road	
0	0
0	**0**

Site 4: Weston Hall Road	
3,383	3,279
3,490 (+3.2%)	**3,556 (+8.4%)**

Site 5: A1067 at Lenwade	
10,347	12,887
12,188 (+17.8%)	**15,841 (+22.9%)**

Site 6: Marl Hill Road	
1,674	3,146
3,317 (+98.1%)	**5,549 (+76.4%)**

Site 7: A1067 at Attlebridge	
9,999	12,245
15,360 (+53.6%)	**19,916 (+62.6%)**

Site 8: Ringland Road	
4,907	7,973
3,454 (-29.6%)	**6,302 (-21.0%)**

Site 9: Costessey Lane (Ringland)	
0	10
0	**0**

Site 10: Taverham Lane	
5,723	6,199
4,727 (-17.4%)	**4,740 (-23.5%)**

Site 11: Costessey Lane	
3,951	4,771
3,758 (-4.9%)	**4,865 (+2%)**

Site 12: Low Road	
4,595	4,906
4,044 (-12%)	**4,083 (-16.8%)**

Site 13: West End	
1,089	2,489
570 (-47.7%)	**1,137 (-54.3%)**

Key

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Figures show Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

- Proposed NDR Scheme Layout
- River Wensum SAC
- Zone of Influence
- Fine Sediment Ingress Point
- Sand and Fine Sediment Ingress Point
- Silt Ingress Point

1:60,000 0 2500m 5000m

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Client

Norfolk County Council
County Hall
Martineau Lane
Norwich, NR1 2SG

Norfolk County Council

Rev	Date	Drawn	Description	Ch'k'd	App'd

Title

Norwich Northern Distributor Road
Habitat Regulations Assessment
Sediment Ingress and Traffic Data

Drawn	SA
Checked	NC
Approved	JF
Scale at A3	1:60,000
Drawing Number	MMD-233906-DT-0995
Rev	0
Status	INF

P:\Norwich\MM Projects\233906 - NDR 2007\233906-DT-01 NDR ES 2012-13 - Drawings\00 - Working Drawings\08 - Nature Conservation\MMD-233906-DT-0995-Rev0 HRA Traffic Data Map.dwg May 9, 2014 - 8:42AM wor44127

B.2. Road drainage site investigation

Table B.2: Site survey observations (26th January 2014)

Site No.	Site name	Presence of formal drainage system e.g. kerbs and gullies	Presence of soil on the road;	Presence of soft verges and evidence of verge damage by vehicles;	Flow down the road and pooling	Direct or indirect connection between road and channel;	Connecting ditches and sediment accumulation within ditches and/or at outfall points	Evidence of river channel and bank erosion up and downstream	Drawing and photo references
1	B1147 Dereham Road	No	Yes	Yes – grassed banks and trees, except the bridge itself	Yes – pooling along road (see Photo 1.1)	Potential - Grassed verge (~1m width) separating the road from river for 15m stretch (see Photo 1.1)	None	No - Banks largely protected by reeds	Drawing No. MMD-233906-DT-0999 (Appendix B). Photos 1.1 to 1.3.
2	Mill Street	No	Yes (see photo 2.3)	Yes	Yes- minor pooling on bridge	Potential - Small sections of fence or gated access but grassed area (~2-3m) between road and river likely to provide some vegetative treatment.	None	No - Banks largely protected by reeds	Drawing No. MMD-233906-DT-1000 (Appendix B) Photos 2.1 to 2.3.
3	Lyng Road	Yes - EA study (2013) suggests a drainage outfall in this location (not visible during visit) but unclear how water is transported from road to outfall (no manholes/ gullies/ grips along road)	Yes - significant amounts along road heading northwards. (see Photo 3.2)	Yes - road narrow and significant verge erosion	Yes – Steep incline in road so likely flows during heavy rainfall.	Yes (EA 2013)	Yes - Two bridges crossing Wensum and tributary. A series of ponds along road draining to river.	Potential – banks and bed not visible due to high river levels.	Drawing No. MMD-233906-DT-1001 (Appendix B). Photos 3.1 to 3.3
4	A1067 at Lenwade	Yes – manholes	No	No – kerbs	No	Yes - pipe work likely to drain to river and/or tributary as no alternatives soakaways identified.	Yes – see Photo 4.4	Yes – low lying grass areas partly flooded with high river levels. Gravels visible on bed.	Drawing No. MMD-233906-DT-1002 (Appendix B). Photos 4.1 to 4.4.

Site No.	Site name	Presence of formal drainage system e.g. kerbs and gullies	Presence of soil on the road;	Presence of soft verges and evidence of verge damage by vehicles;	Flow down the road and pooling	Direct or indirect connection between road and channel;	Connecting ditches and sediment accumulation within ditches and/or at outfall points	Evidence of river channel and bank erosion up and downstream	Drawing and photo references
5	Weston Hall Road	Series of manholes within the first 100m of A1067. Remainder drains via grips cut into banks into ditch.	Yes – high sediment load	Yes – narrow grassed verges.	Yes - pooling	Yes – indirect via drain.	Yes – grips cleared but large amounts of sediment within ditch (not maintained). Some held back by reeds. Small wooded weir damaged and no longer functioning. Grips under fence – receiving ditch not visible.	As above for A1067 at Lenwade	Drawing No. MMD-233906-DT-1003 (Appendix B) Photos 5.1 to 5.4. Drawing R1C093-R1-4909-4917 (Appendix G)
6	Marl Hill Road	No – short length of ditch (~15m) and grips directing flow. Appears to act as soakaway.	Yes	Yes	Yes -pooling	No direct link – Road drains away from Fakenham Road and the River Wensum to the east.	None	N/A	Drawing No. MMD-233906-DT-1004 and Figure B.1 (Appendix B) Photos 6.1 and 6.2
7	A1067 at Attlebridge	Yes – manholes which appear to drain to tributary via a grip from the bridge	No	Yes – kerbed across the bridge and grassed verges beyond. No damage visible.	No	Yes – indirect via tributary	Yes - at the base of the grip within the tributary.	Yes – exposed grass banks. Edges largely hidden due to high flows.	Drawing No. MMD-233906-DT-1005 and Figure B.2 (Appendix B) Photos 7.1 and 7.3

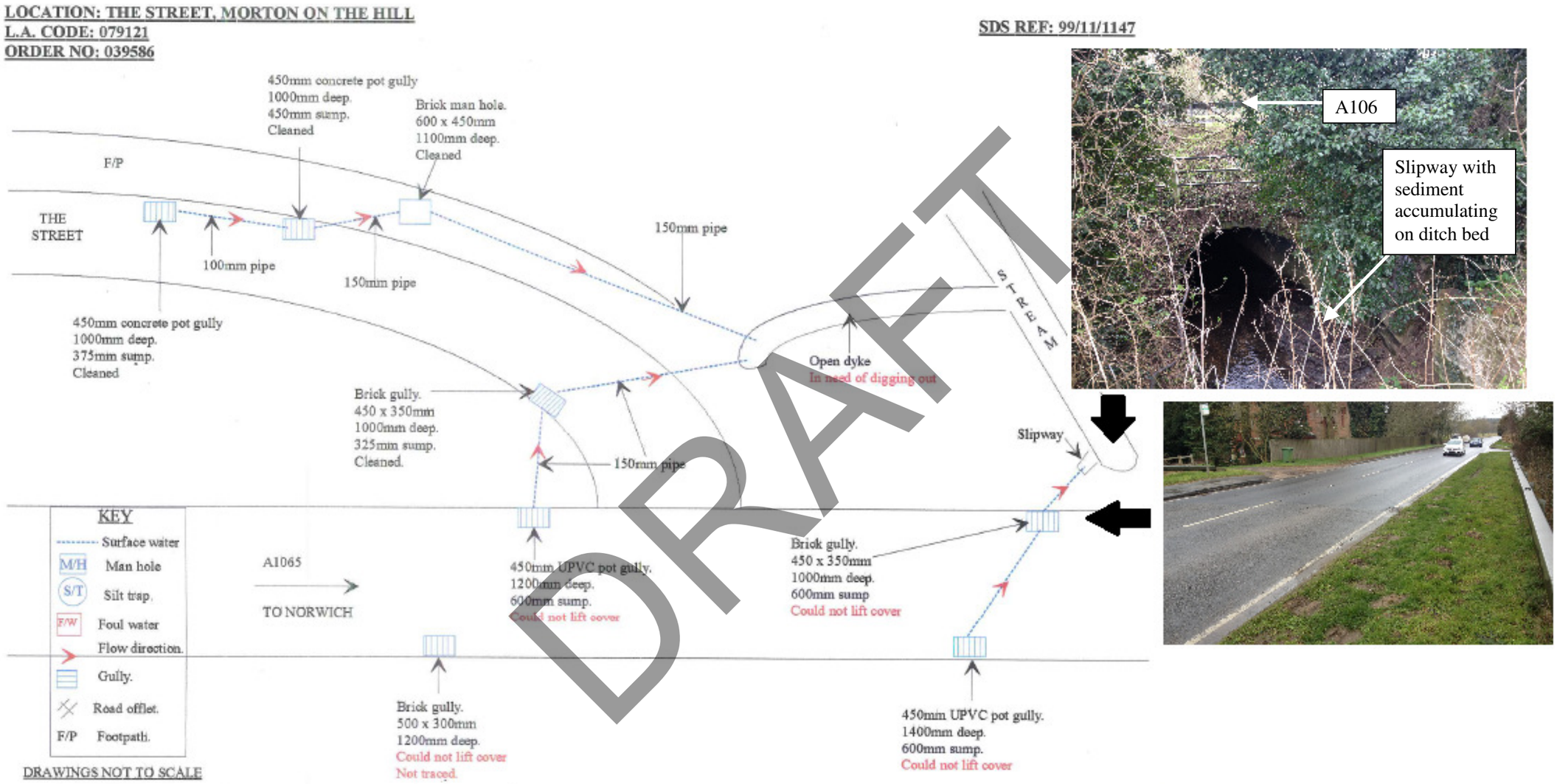
Site No.	Site name	Presence of formal drainage system e.g. kerbs and gullies	Presence of soil on the road;	Presence of soft verges and evidence of verge damage by vehicles;	Flow down the road and pooling	Direct or indirect connection between road and channel;	Connecting ditches and sediment accumulation within ditches and/or at outfall points	Evidence of river channel and bank erosion up and downstream	Drawing and photo references
8	Ringland Road	No	Yes	Yes	Yes	Yes – direct through bridge structure and indirect via ditch	Yes – ditches filled with reeds between road and river (downstream)	Potential – Not visible due to high river flows. Natural reedbed area flooded.	Drawing No. MMD-233906-DT-1006 (Appendix B) Photos 8.1 and 8.4
9	Costessey Lane (Ringland)	No	Yes	Yes	Yes - pooling	Yes – direct where grips cut into banks (~300m stretch) creating direct flow path to river where road adjacent to river (see Photos 9.2 and 9.3 and location on drawing).	No – direct discharge	Potential for bank erosion	Drawing No. MMD-233906-DT-1007 (Appendix B) Photos 9.1 and 9.3
10	Taverham Lane	Yes – manholes along road	Yes	Yes – kerbs and soft verges	Yes - pooling	Yes – indirectly via drains and directly via holes in bridge walls.	Yes – drains via ditch linked to tributary of Wensum (Photo 10.2)	Not recorded	Drawing No. MMD-233906-DT-1008 (Appendix B) Photos 10.1 and 10.4
11	Costessey Lane	No	Yes – large quantities in parking bay	Yes	Yes – pooling along road and in parking bay	No – only along bridge through sides (photo 12.1)	No	Potential for bank erosion particular during high flows (banks not visible)	Drawing No. MMD-233906-DT-1010 (Appendix B) Photos 12.1 and 12.4

Site No.	Site name	Presence of formal drainage system e.g. kerbs and gullies	Presence of soil on the road;	Presence of soft verges and evidence of verge damage by vehicles;	Flow down the road and pooling	Direct or indirect connection between road and channel;	Connecting ditches and sediment accumulation within ditches and/or at outfall points	Evidence of river channel and bank erosion up and downstream	Drawing and photo references
12	Low Road	No	Yes	Yes	Yes - pooling	No – none identified	No	Potential for bank erosion particular during high flows (banks not visible)	Drawing No. MMD-233906-DT-1011 (Appendix B) Photos 13.1 and 13.3

B.3. Drainage plans – site verification (7th March 2014)

Figure B.1: Drainage plans and site photographs – Marl Hill Road

Figure B.2: Drainage plan and site photographs – The Street and A1067 at Atllebridge



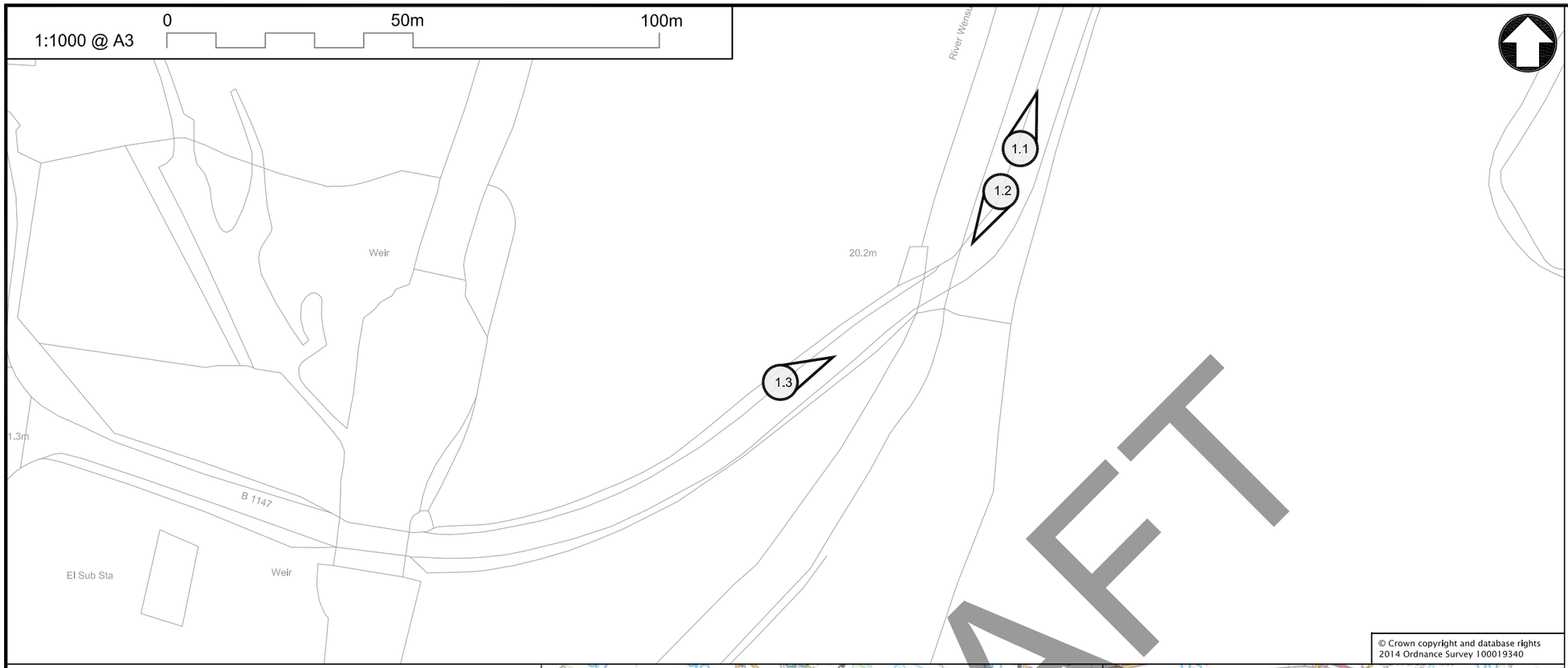


Photo 1.1

Photo 1.2

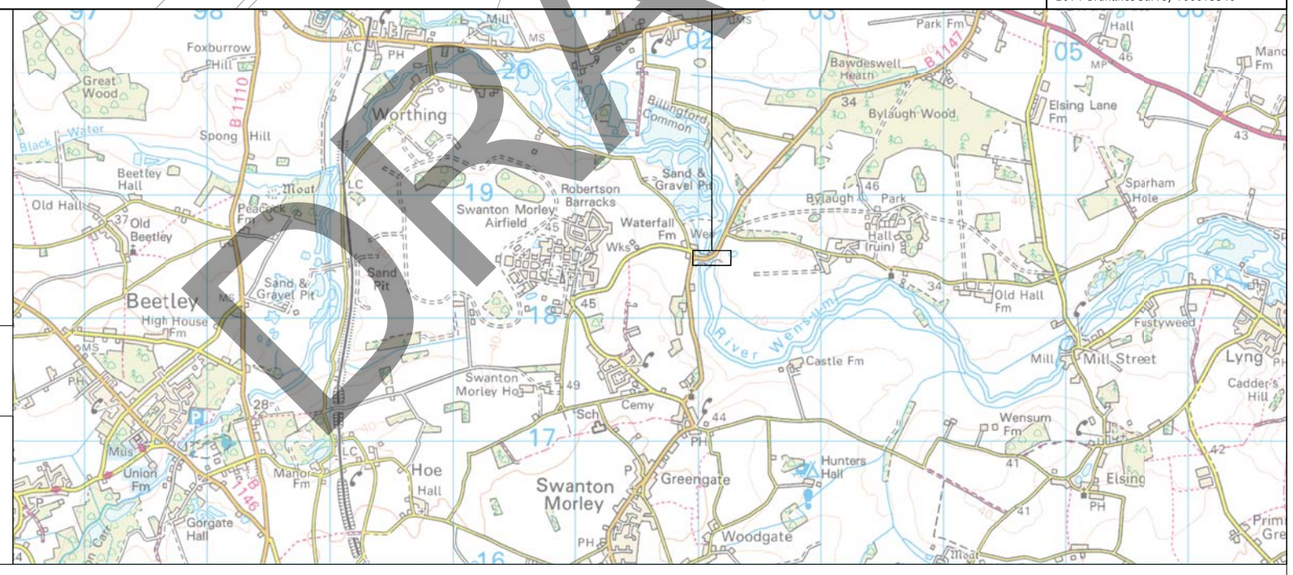
Photo 1.3

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

B1147 Dereham Road	
2,344	2,999
2,297 (-2%)	**2,876 (-4.1%)**



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Rev	Date	Drawn	Description	Ch'k'd	App'd
0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
B1147 Dereham Road - 1 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1000

Drawing Number: MMD-233906-DT-0999

Rev	Status
0	INF

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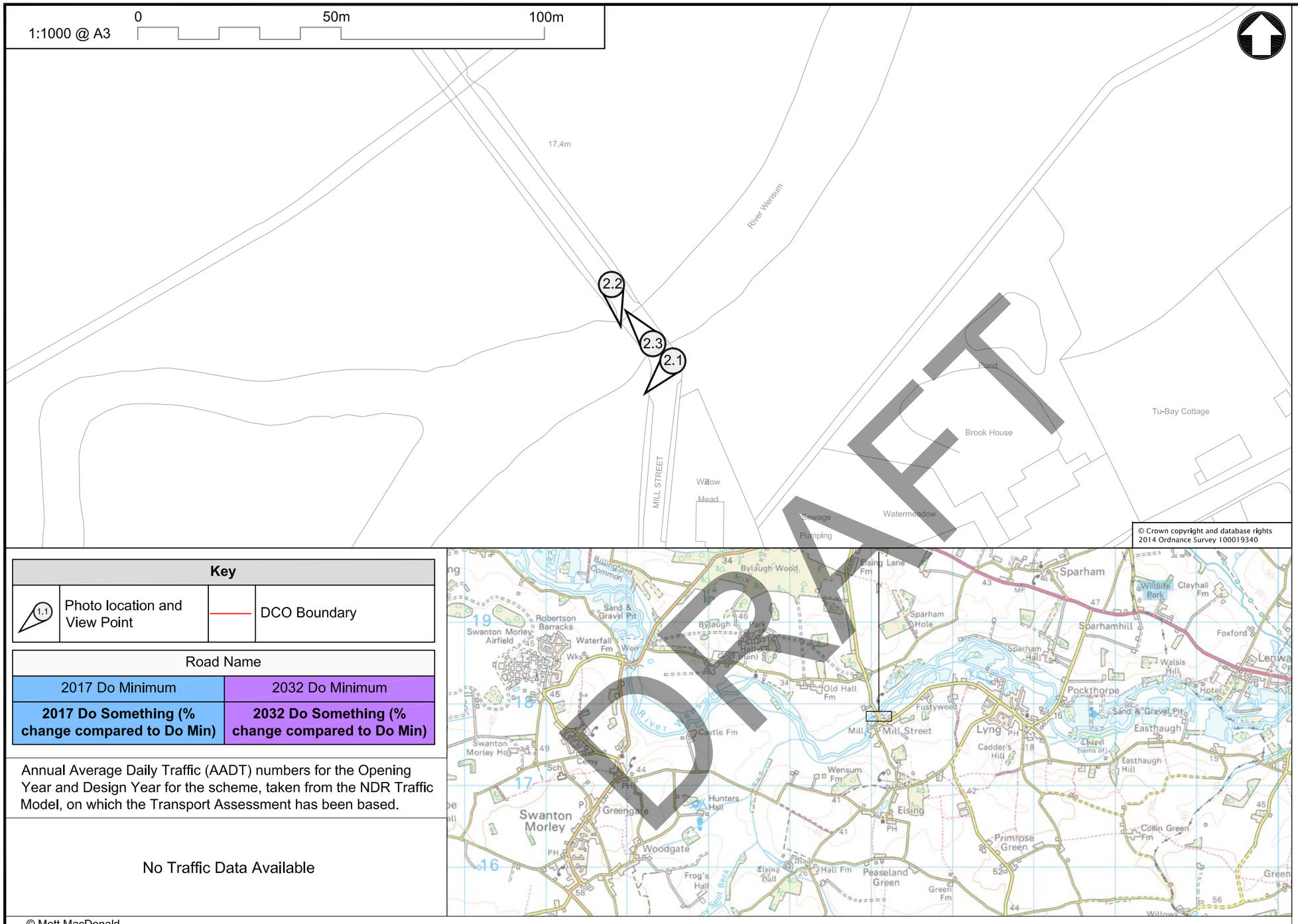

Key

1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

No Traffic Data Available

Photo 2.1

Photo 2.2

Photo 2.3

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0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Mill Street - 2 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1000

Drawing Number: MMD-233906-DT-1000

Rev: 0

Status: INF

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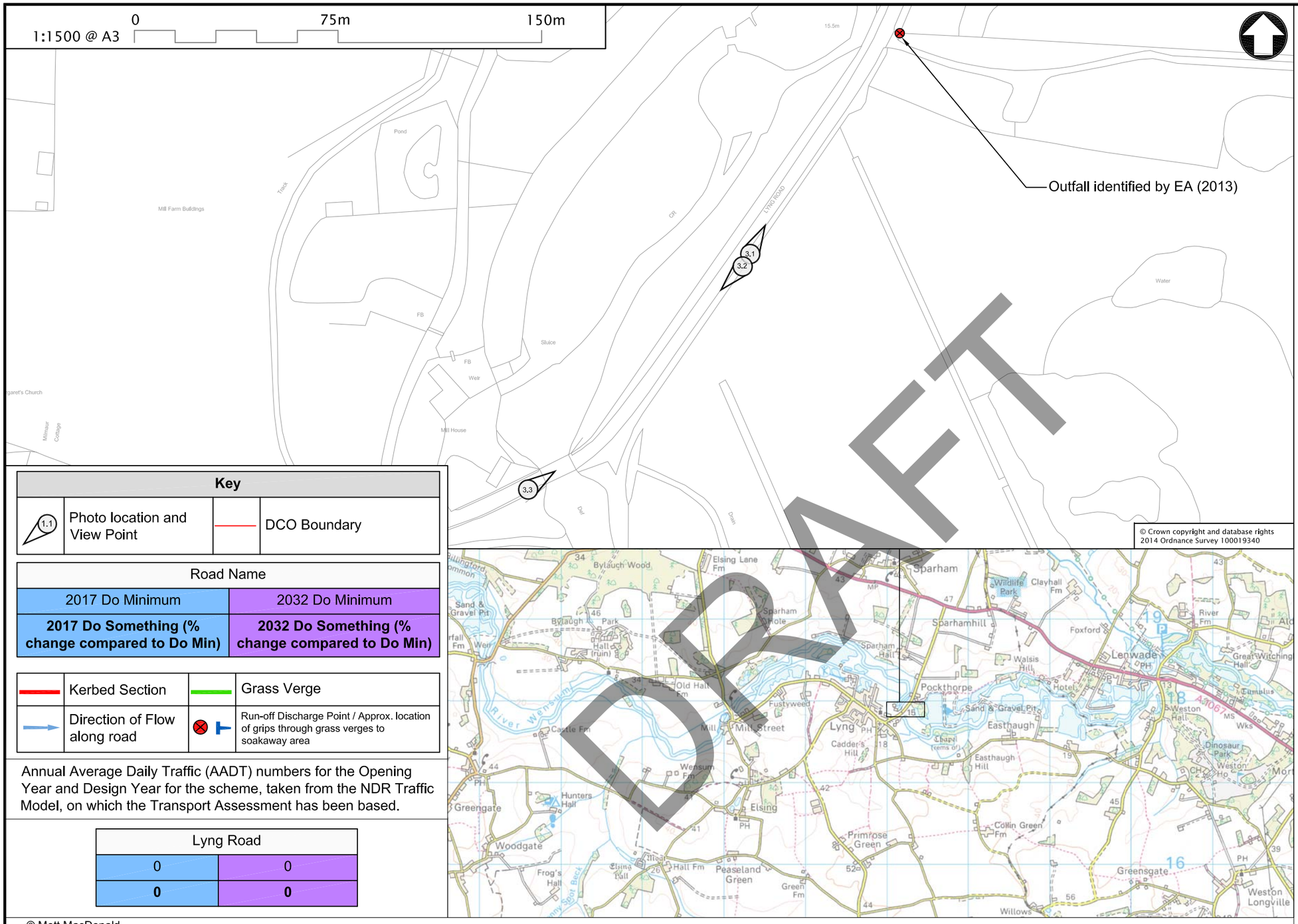

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

	Kerbed Section		Grass Verge
	Direction of Flow along road		Run-off Discharge Point / Approx. location of grips through grass verges to soakaway area

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Lyng Road	
0	0
0	**0**

Photo 3.1

Photo 3.2

Photo 3.3

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0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Lyng Road - 3 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1500
Drawing Number	MMD-233906-DT-1001
Rev	0
Status	INF

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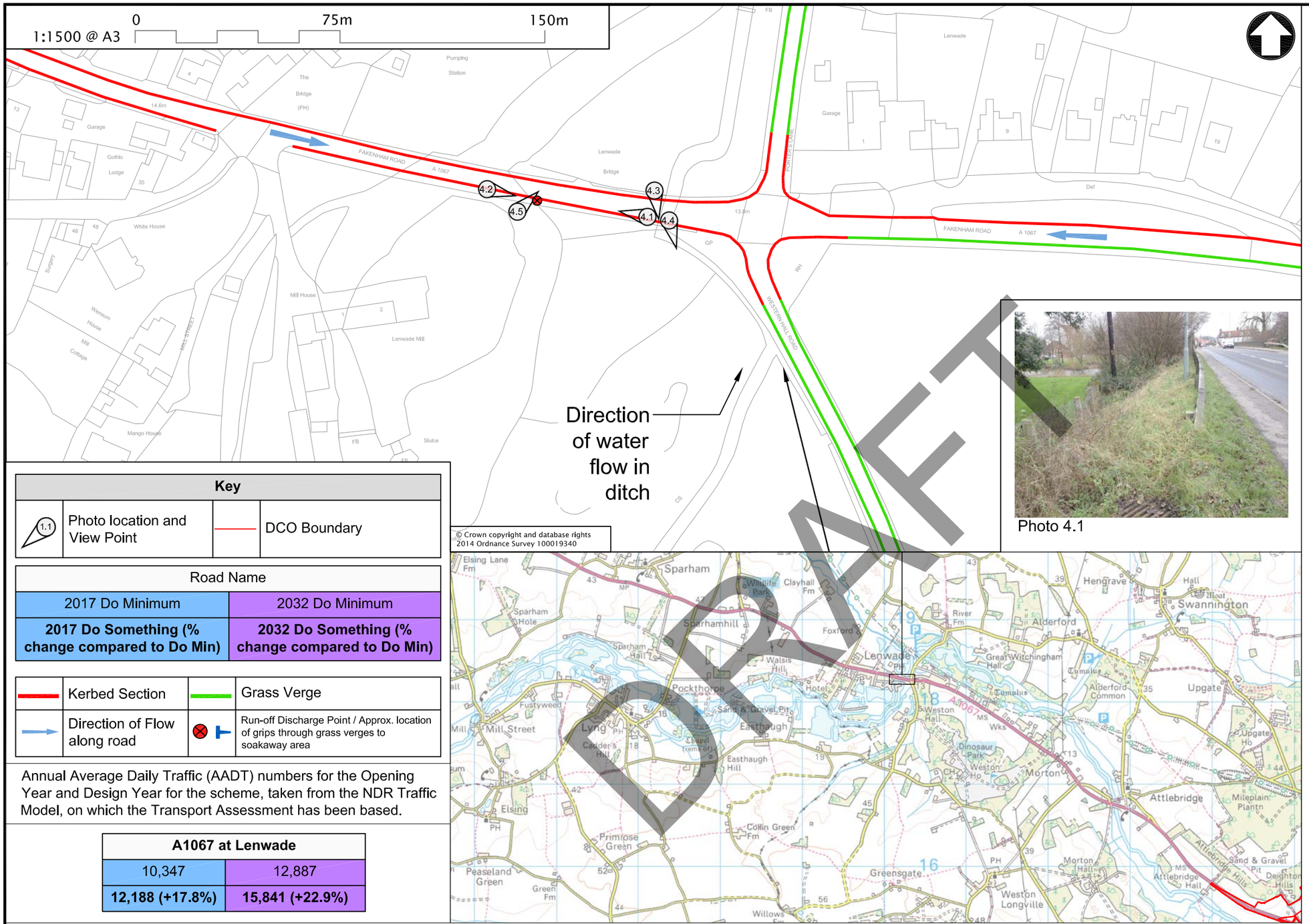

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

	Kerbed Section		Grass Verge
	Direction of Flow along road		Run-off Discharge Point / Approx. location of grips through grass verges to soakaway area

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

A1067 at Lenwade	
10,347	12,887
12,188 (+17.8%)	**15,841 (+22.9%)**

Photo 4.1

Photo 4.2

Photo 4.3

Photo 4.4

Photo 4.5

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0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
A1067 Fakenham Road - 4 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1500
Drawing Number	MMD-233906-DT-1002
Rev	0
Status	INF

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1:2000 @ A3 — 0 — 100m — 200m

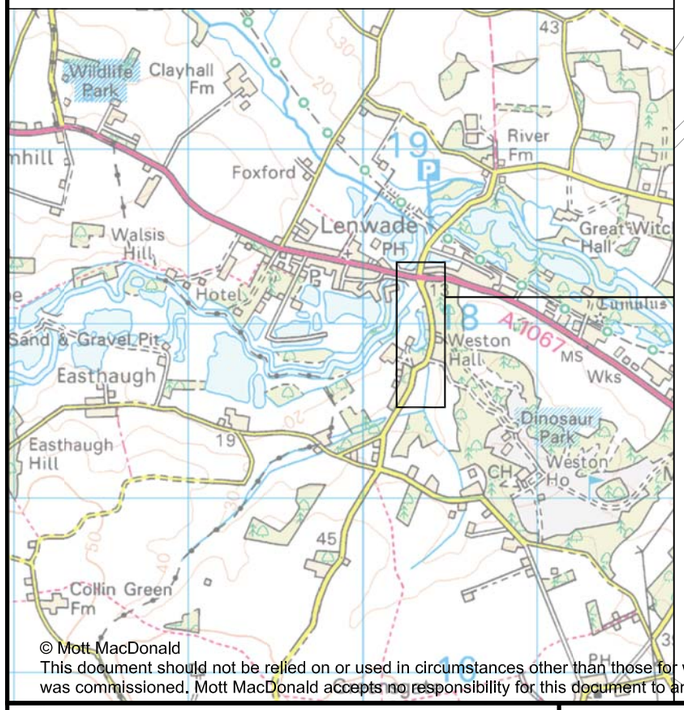
Key			
1.1	Photo location and View Point		DCO Boundary

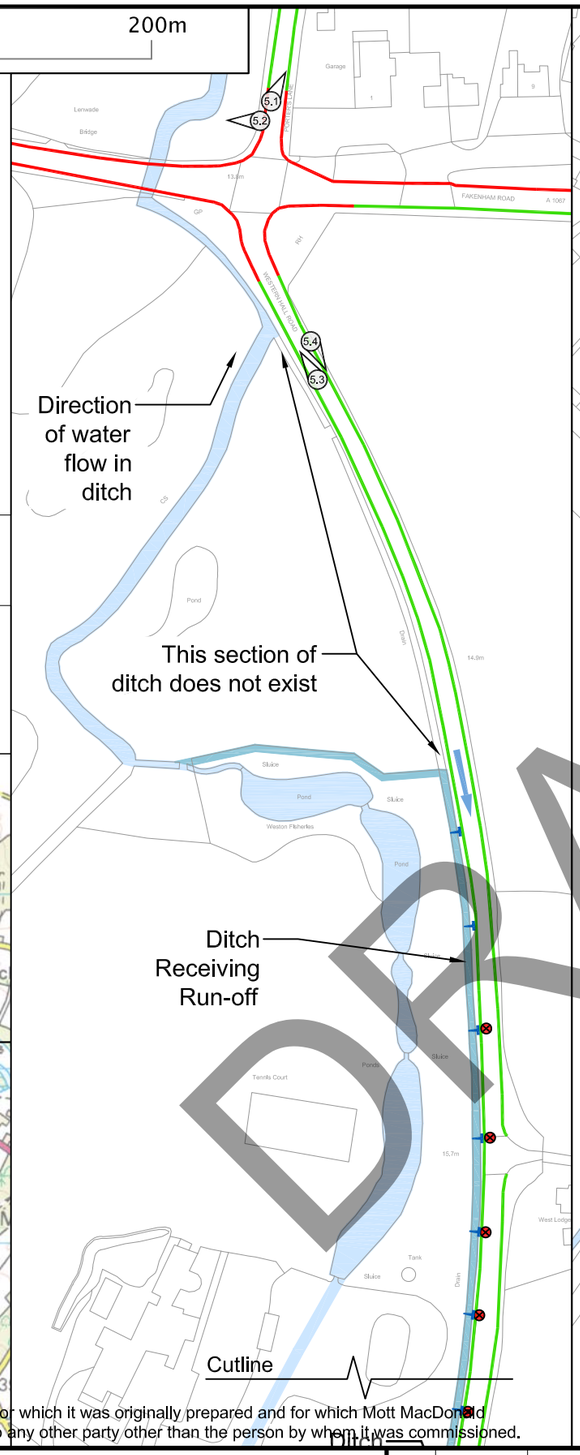
Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

	Kerbed Section		Grass Verge
	Direction of Flow along road		Run-off Discharge Point / Approx. location of grips through grass verges to soakaway area

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Weston Hall Road	
3,383	3,279
3,490 (+3.2%)	**3,556 (+8.4%)**





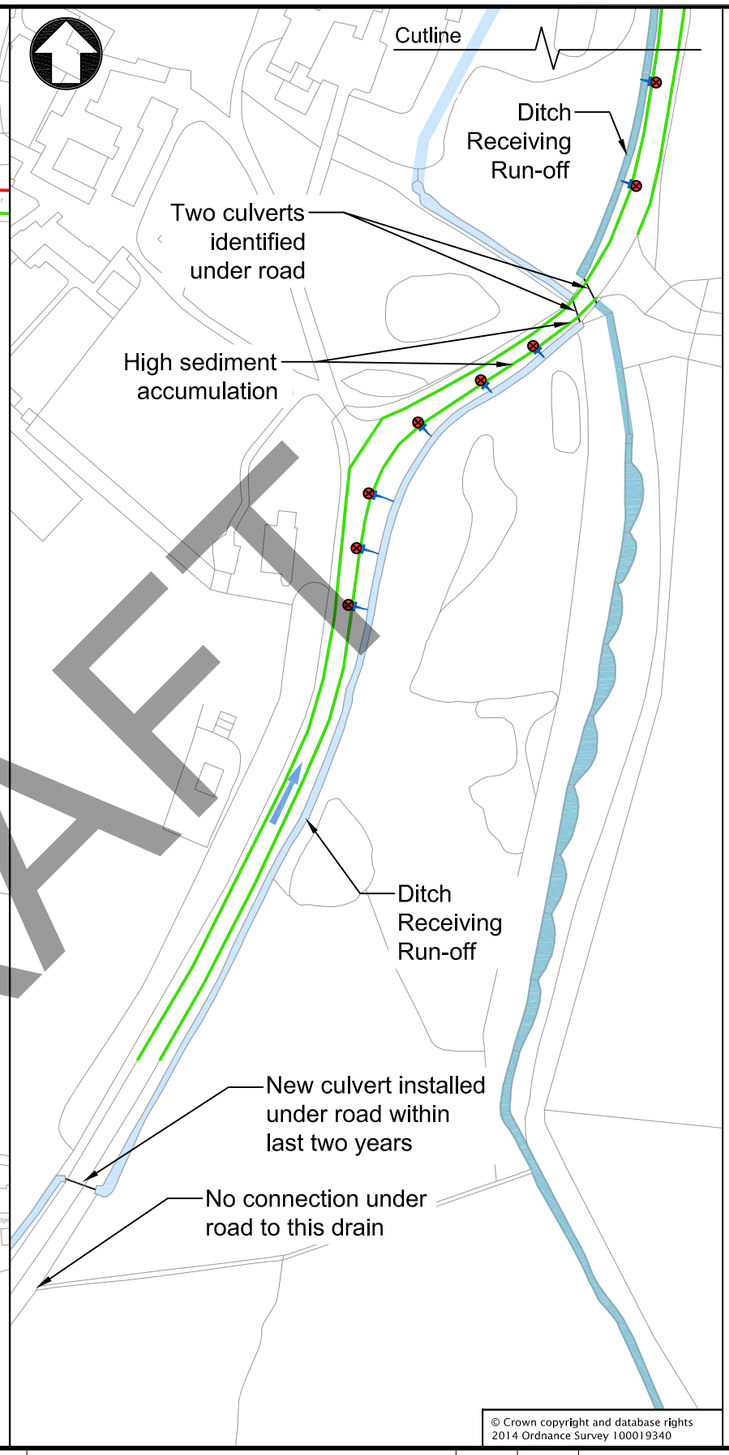



Photo 5.1


Photo 5.2


Photo 5.3


Photo 5.4

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0	02/14	NJC	First Issue	RD	JF

Title: Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Western Hall Rd - 5 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:2000
Drawing Number	MMD-233906-DT-1003
Rev	0
Status	INF

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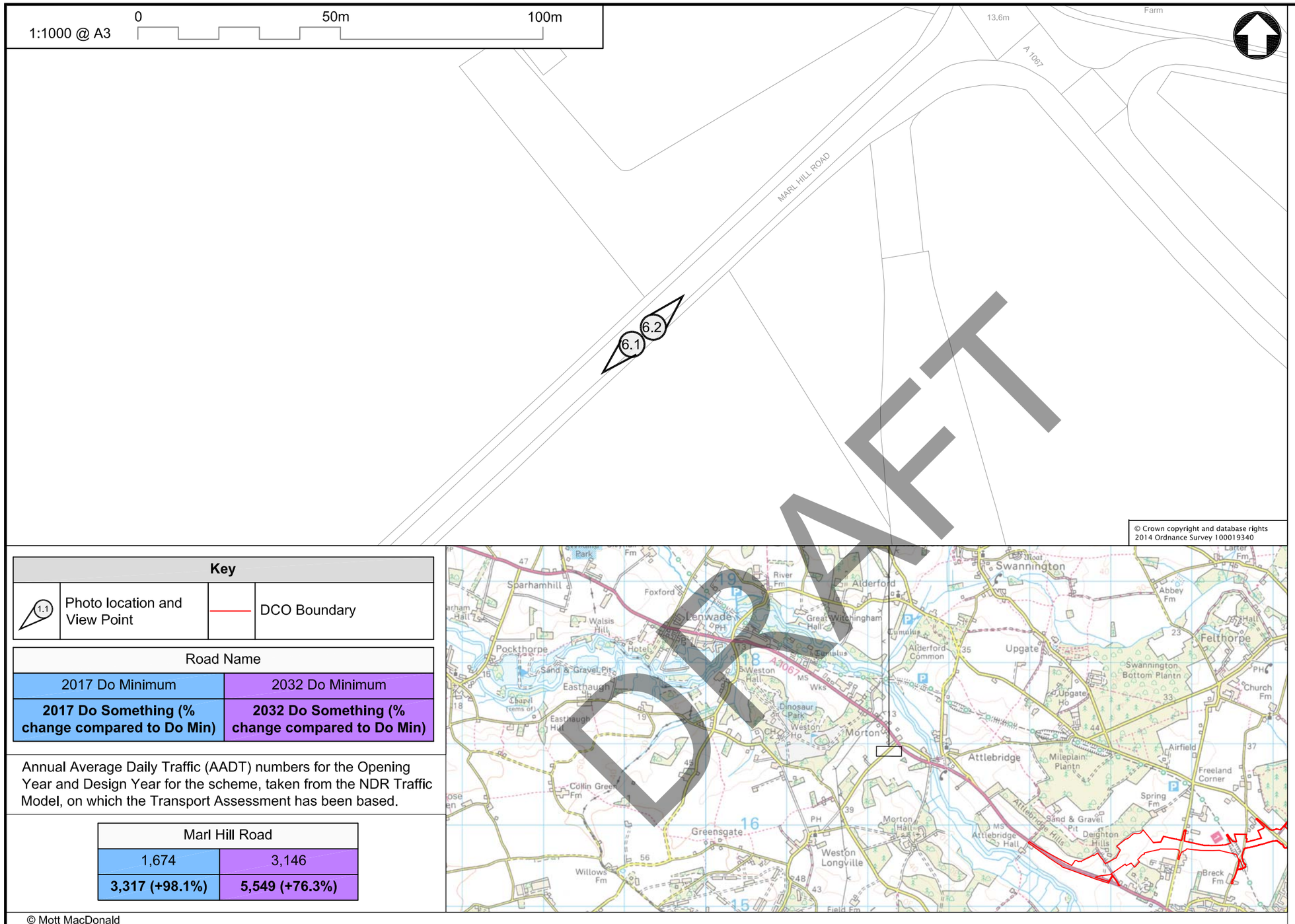

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Marl Hill Road	
1,674	3,146
3,317 (+98.1%)	**5,549 (+76.3%)**

Photo 6.1

Photo 6.2

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0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Marl Hill Road - 6 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1000
Drawing Number	MMD-233906-DT-1004
Rev	0
Status	INF

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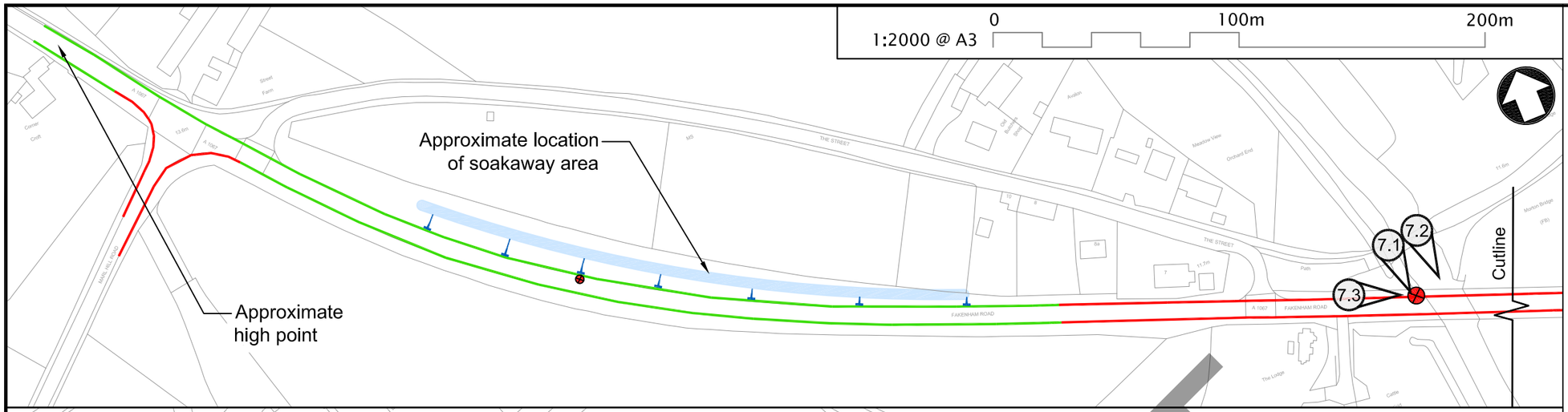

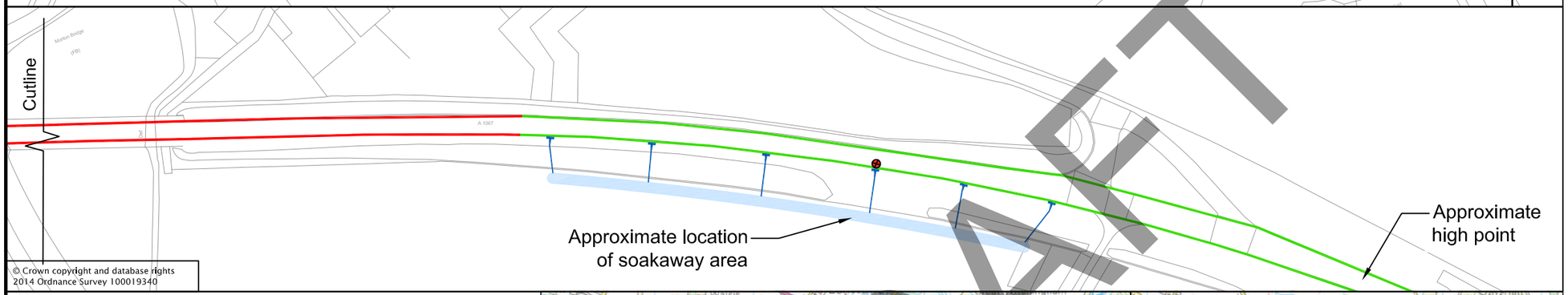

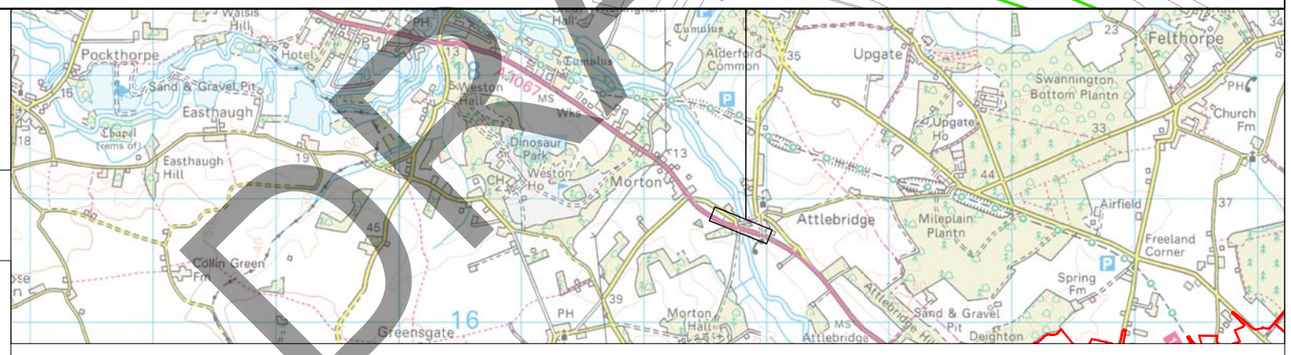

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

A1067 at Attlebridge	
9,999	12,245
15,360 (+53.6%)	**19,916 (+62.6%)**

Key

1.1 Photo location and View Point		DCO Boundary	
	Kerbed Section		Grass Verge
	Direction of Flow along road		Run-off Discharge Point / Approx. location of grips through grass verges to soakaway area

Photo 7.1

Photo 7.2

Photo 7.3

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Rev	Date	Drawn	Description	Ch'k'd	App'd
0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
A1067 Fakenham Road - 7 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:2000

Drawing Number	Rev	Status
MMD-233906-DT-1005	0	INF

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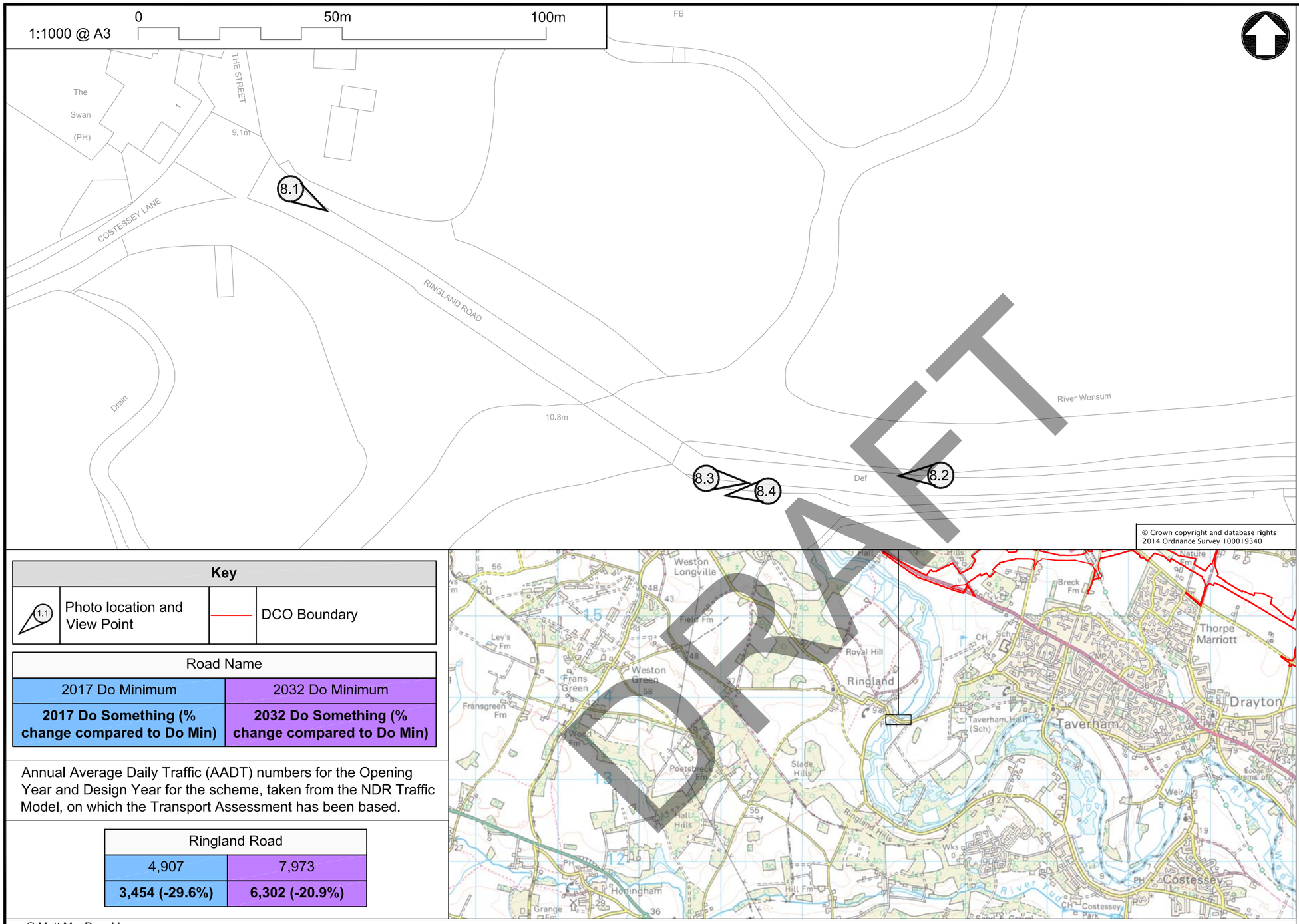

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Ringland Road	
4,907	7,973
3,454 (-29.6%)	**6,302 (-20.9%)**

Photo 8.1

Photo 8.2

Photo 8.3

Photo 8.4

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Norfolk County Council

Rev	Date	Drawn	Description	Ch'k'd	App'd
0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Ringland Road - 8 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1000
Drawing Number	MMD-233906-DT-1006
Rev	0
Status	INF

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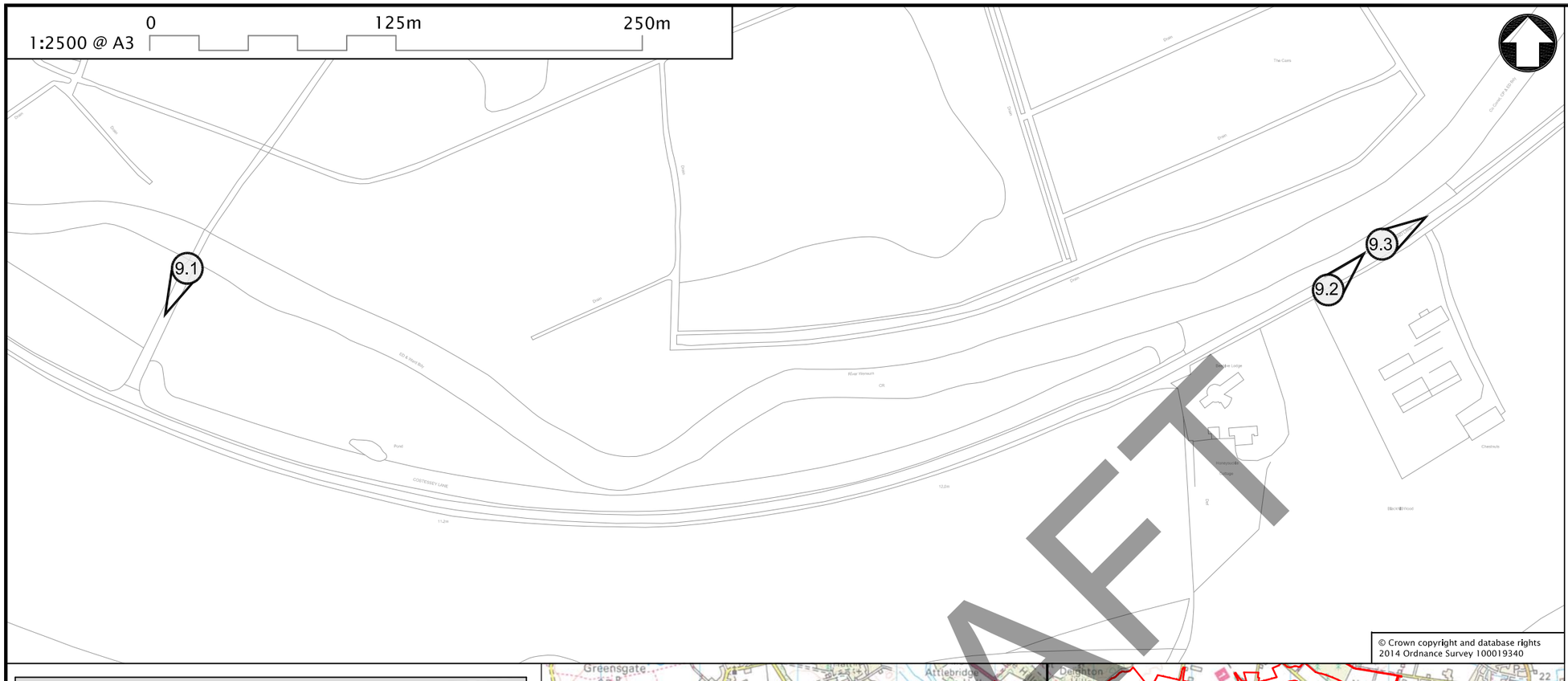

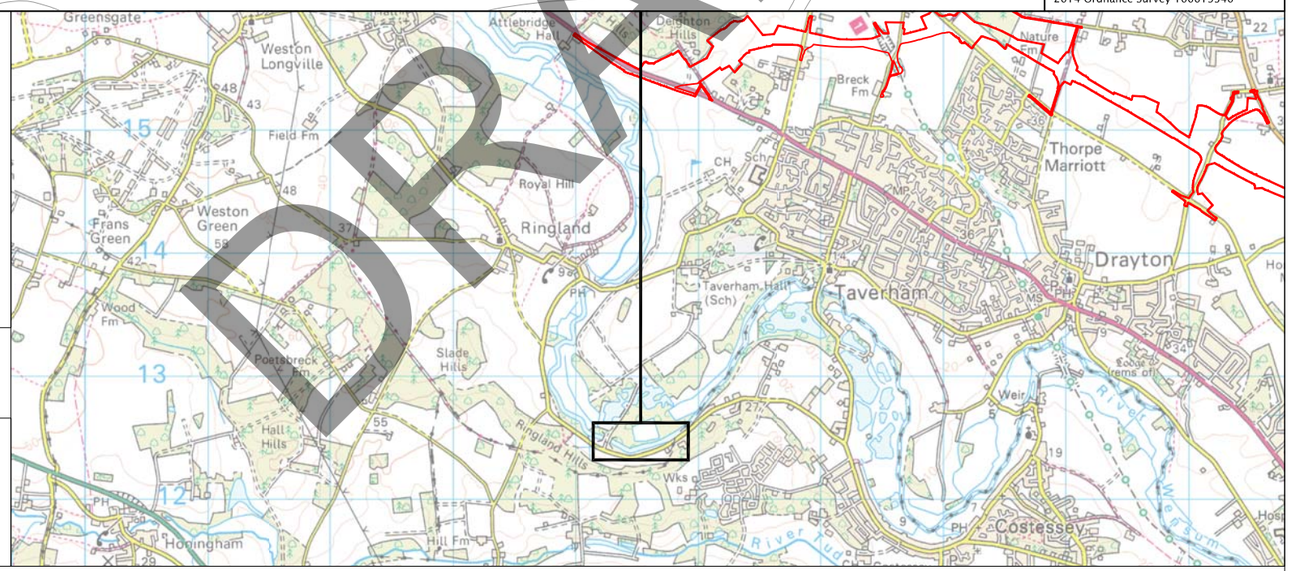

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Costessey Lane (Ringland)	
0	10
0	**0**

Photo 9.1

Photo 9.2

Photo 9.3

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Norfolk County Council

Rev	Date	Drawn	Description	Ch'k'd	App'd
0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Costessey Lane - 9 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:2500

Drawing Number: MMD-233906-DT-1007

Rev	Status
0	INF

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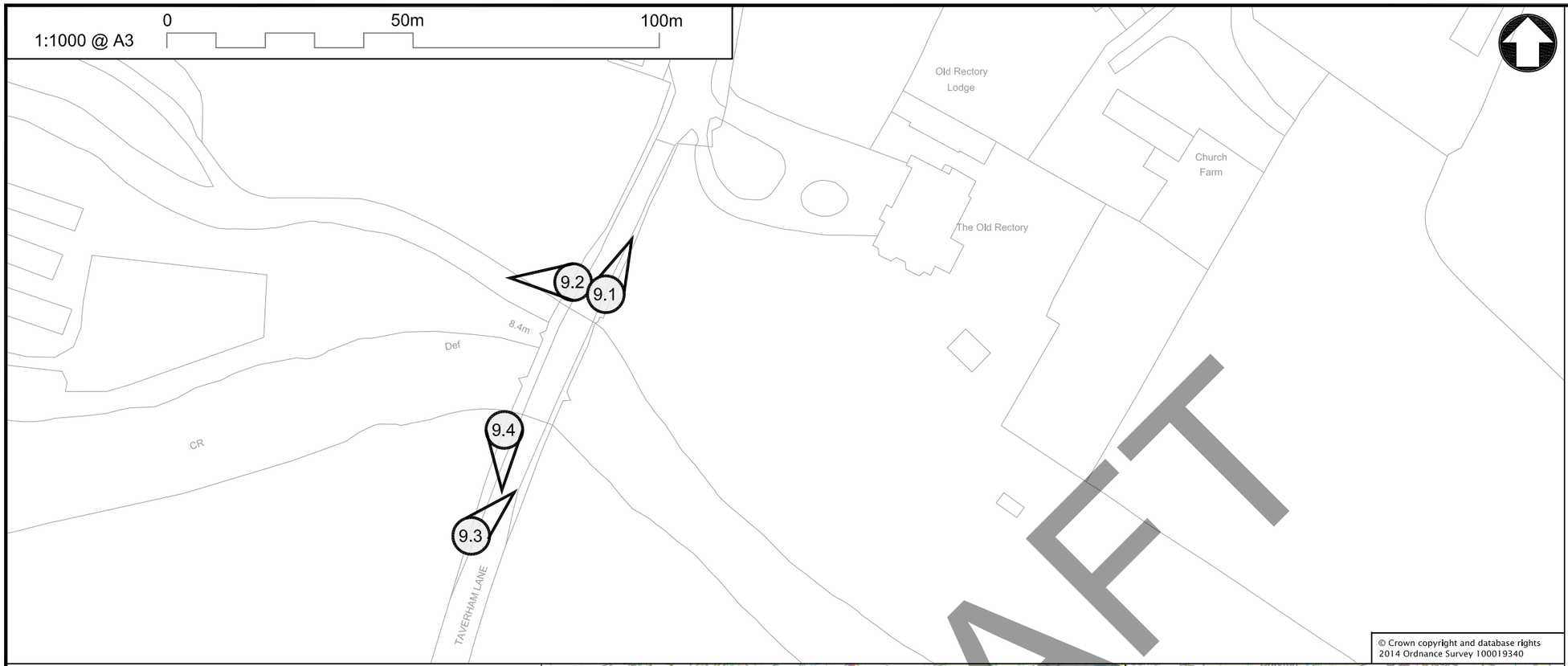

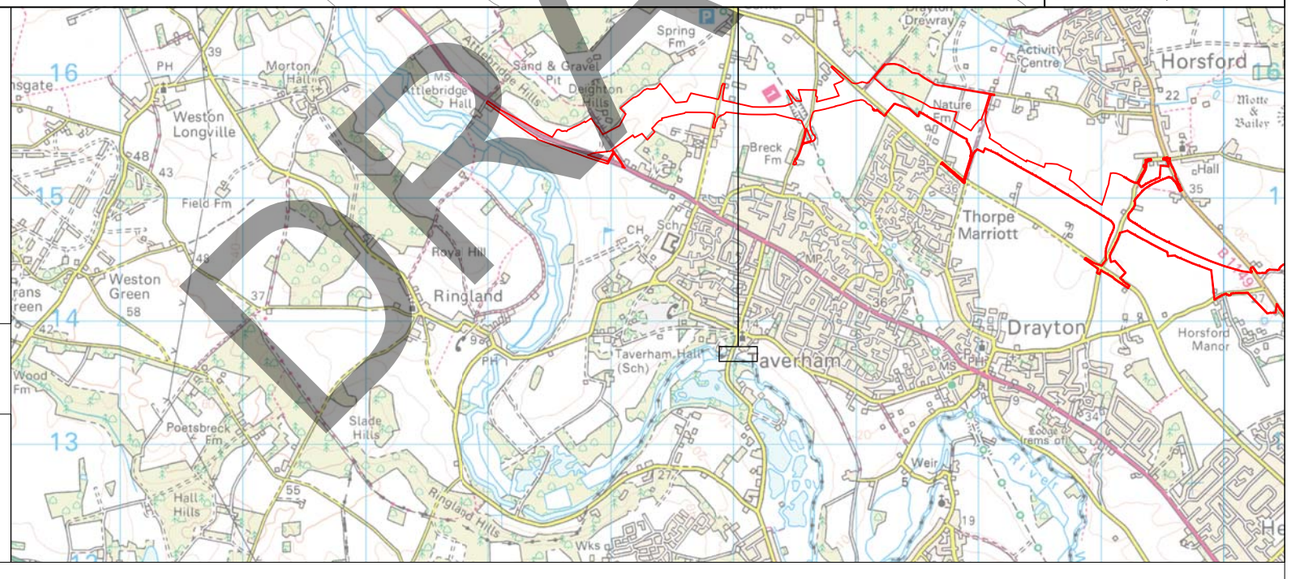

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Taverham Lane	
5,723	6,199
4,727 (-17.4%)	**4,740 (-23.5%)**

Photo 9.1

Photo 9.2

Photo 9.3

Photo 9.4

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Client

Norfolk County Council
County Hall
Martineau Lane
Norwich, NR1 2SG

Norfolk County Council

Rev	Date	Drawn	Description	Ch'k'd	App'd
0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Taverham Lane - 10 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1000
Drawing Number	MMD-233906-DT-1008
Rev	0
Status	INF

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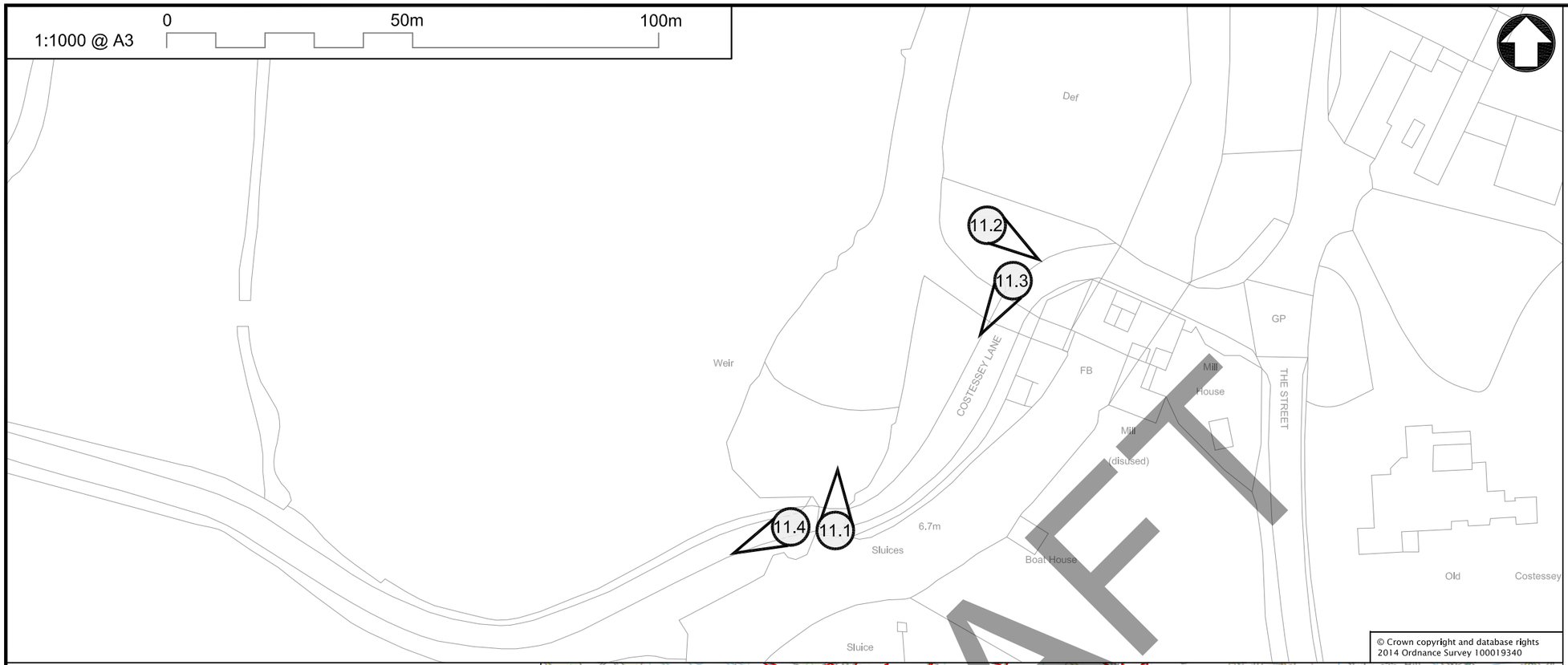

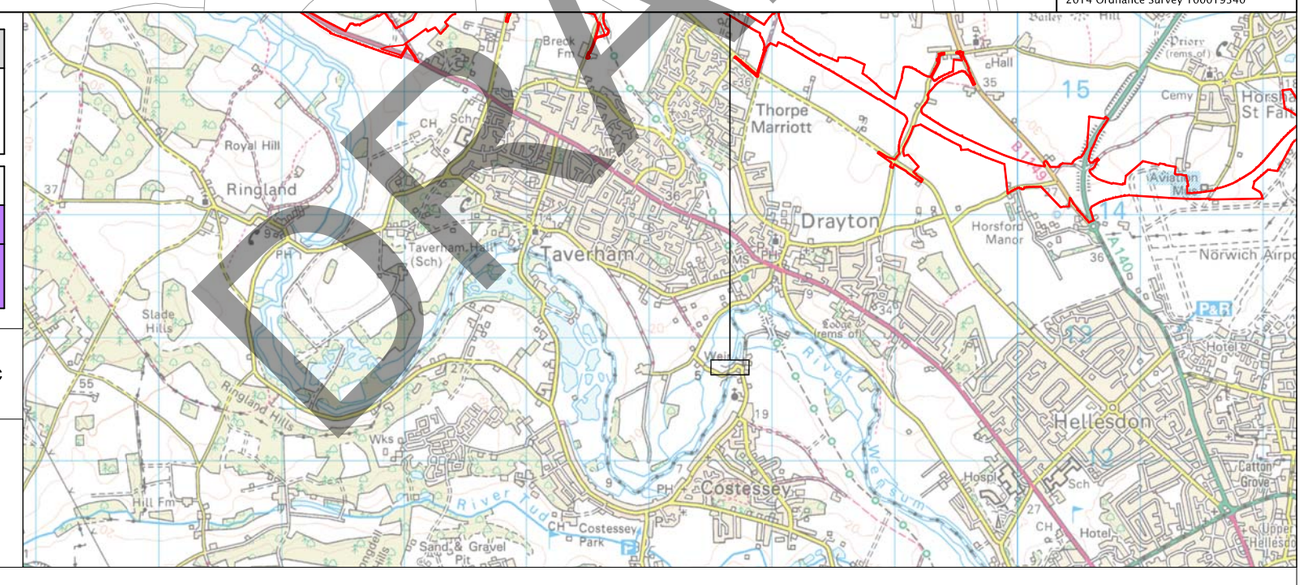

Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Costessey Lane	
3,951	4,771
3,758 (-4.8%)	**4,865 (+2%)**

Photo 11.1

Photo 11.2

Photo 11.3

Photo 11.4

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Rev	Date	Drawn	Description	Ch'k'd	App'd
0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Costessey Lane - 11 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1000
Drawing Number	MMD-233906-DT-1009
Rev	0
Status	INF

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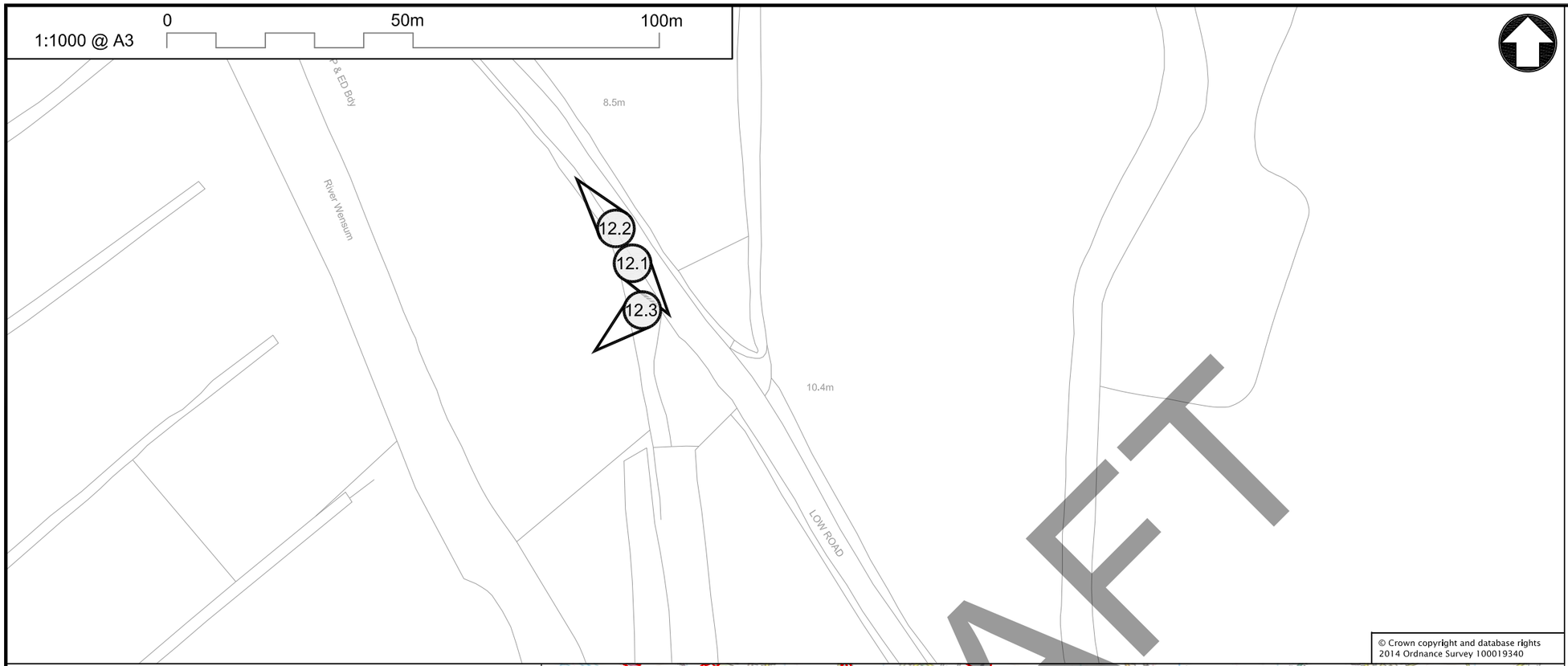
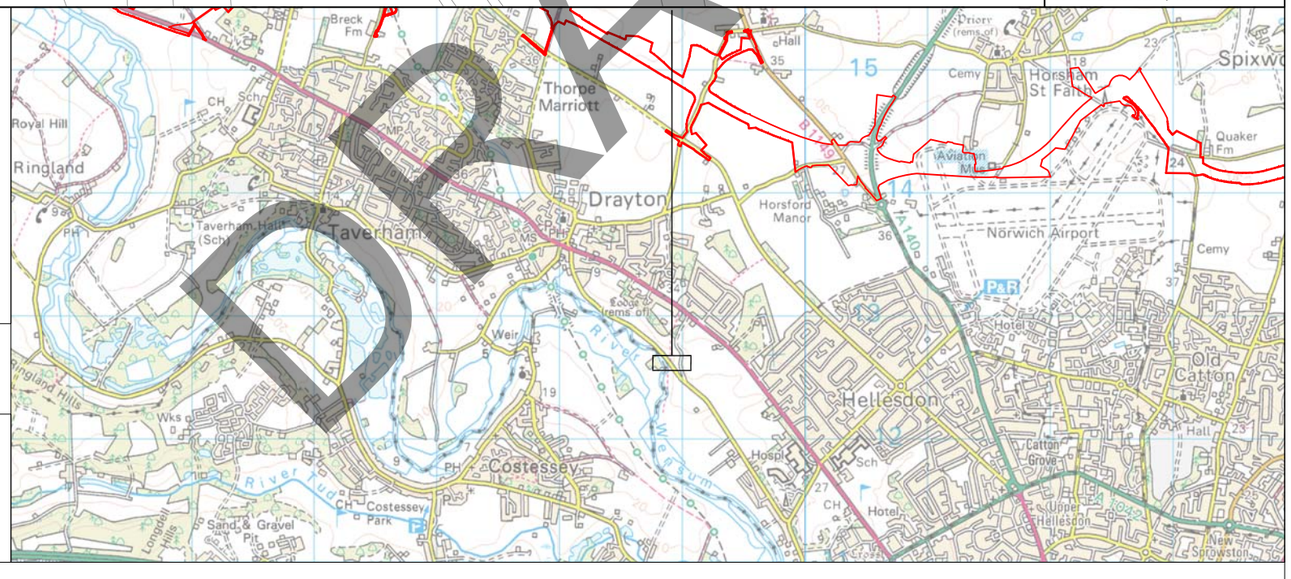
1:1000 @ A3

0 50m 100m





Key			
1.1	Photo location and View Point		DCO Boundary

Road Name	
2017 Do Minimum	2032 Do Minimum
2017 Do Something (% change compared to Do Min)	**2032 Do Something (% change compared to Do Min)**

Annual Average Daily Traffic (AADT) numbers for the Opening Year and Design Year for the scheme, taken from the NDR Traffic Model, on which the Transport Assessment has been based.

Low Road	
4,595	4,906
4,044 (-12%)	**4,083 (-16.8%)**

Photo 12.1

Photo 12.2

Photo 12.3

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Norfolk County Council

Rev	Date	Drawn	Description	Ch'k'd	App'd
0	02/14	NJC	First Issue	RD	JF

Title

Norwich Northern Distributor Road

Habitat Regulations Assessment
Road Drainage Site Investigation
Low Road - 12 of 12

Drawn	NJC
Checked	RD
Approved	JF
Scale at A3	1:1000

Drawing Number: MMD-233906-DT-1010

Rev: 0

Status: INF

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Appendix C. DMRB risk assessments and plans

Table C.1: Data used in HAWRAT assessment

Data type	Data source	A1067 at Lenwade (River Wensum)	A1067 at Attlebridge (Tributary to R. Wensum)
Traffic density (AADT)	Table 3.1 of this report	15,841	19,915
Climatic region	Flood estimation handbook	Warm Dry	Warm Dry
Rainfall site	Nearest to site of interest	Ipswich	Ipswich
Q95 (m^3/sec)	CEH website	0.922	0.1 (estimated)
Impermeable road area (ha)	Estimated from site visit & measurement taken from online mapping tools.	5.14 (Road catchment 4200 m long & 12m wide)	1.4 (Road catchment 1200m long & 12m wide)
Permeable road area (ha)	Assumed zero (conservative approach)	0	0
Base Flow Index	CEH website	0.75	0.5 (estimated)
Water hardness (mg/l)	Water quality data collected intermittently between Sept 2006 and June 2013.	250-370	250-370 (estimated)
River width (m)	Estimated from site visit & measurement taken from online mapping tools.	22	1

Figure C.1: HAWRAT results – A1067 at Lenwade

HIGHWAYS AGENCY

Highways Agency Water Risk Assessment Tool version 1.0 November 2009

Soluble - Acute Impact

Annual Average Concentration

	Copper	Zinc	
Step 2	0.00	0.01	ug/l
Step 3	-	-	ug/l

Copper: Pass

Zinc: Pass

Sediment - Chronic Impact

Alert. Protected Area.

Sediment deposition for this site is judged as:

Accumulating?	Yes	0.05	Low flow Vel m/s
Extensive?	No	9	Deposition Index

Location Details

Road number	A1067 at Lenwade	HA Area / DBFO number	
Assessment type	Non-cumulative assessment (single outfall)		
OS grid reference of assessment point (m)	Easting	Northing	
OS grid reference of outfall structure (m)	Easting	Northing	
Outfall number	A	List of outfalls in cumulative assessment	
Receiving watercourse	River Wensum		
EA receiving water Detailed River Network ID		Assessor and affiliation	RD (MM)
Date of assessment	41793	Version of assessment	1
Notes	A1067 at Lenwade		

Step 1 Runoff Quality

AADT: >10,000 and <50,000 | Climatic region: Warm Dry | Rainfall site: Ipswich (SAAR 550mm)

Step 2 River Impacts

Annual 95%ile river flow (m^3/s): 0.922 (Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only)

Impermeable road area drained (ha): 5.14 | Permeable area draining to outfall (ha): 0

Base Flow Index (BFI): 0.75 | Is the discharge in or within 1 km upstream of a protected site for conservation? Yes

For dissolved zinc only — Water hardness: High = >200mg CaCO3/l

For sediment impact only — Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No

Tier 1 — Estimated river width (m): 22

Tier 2 — Bed width (m): 3 | Manning's n: 0.07 | Side slope (m/m): 0.5 | Long slope (m/m): 0.0001

Step 3 Mitigation

	Brief description	Estimated effectiveness: Treatment for solubles (%)		Attenuation for solubles - restricted discharge rate (l/s)		Settlement of sediments (%)	
Existing measures		0	D	Unlimited	D	0	D
Proposed measures		0	D	Unlimited	D	0	D

Predict Impact

Show Detailed Results

Exit Tool

HIGHWAYS AGENCY

View Spillage Assessment Parameters | Reset | Go To Runoff Risk Assessment Interface

Assessment of Priority Outfalls

Method D - assessment of risk from accidental spillage

		A (main road)	B	C	D	E	F	Totals	Return Period (years)
		Additional columns for use if other roads drain to the same outfall							
D1	Water body type	Surface watercourse	Surface watercourse						
D2	Length of road draining to outfall *(m)*	3,486	800						
D3	Road Type *(A-road or Motorway)*	A	A						
D4	If A road, is site urban or rural?	Rural	Rural						
D5	Junction type	No junction	Cross road						
D6	Location	< 1 hour	< 1 hour						
D7	Traffic flow (AADT two way)	15,841	15,841						
D8	% HGV	4	4						
D8	Spillage factor *(no/10^9 HGVkm/year)*	0.29	0.88						
D9	Risk of accidental spillage	0.00023	0.00016	0.00000	0.00000	0.00000	0.00000		
D10	Probability factor	0.60	0.60						
D11	Risk of pollution incident	0.00014	0.00010	0.00000	0.00000	0.00000	0.00000		
D12	Is risk greater than 0.01?	**No**	**No**						
D13	Return period without pollution reduction measures	0.00014	0.00010	0.00000	0.00000	0.00000	0.00000	0.0002	4202
D14	Existing measures factor	1	1						
D15	Return period with existing pollution reduction measures	0.00014	0.00010	0.00000	0.00000	0.00000	0.00000	0.0002	4202
D16	Proposed measures factor	1	1						
D17	Residual with proposed Pollution reduction measures	0.00014	0.00010	0.00000	0.00000	0.00000	0.00000	0.0002	4202

Figure C.2: HAWRAT results – A1067 at Attlebridge

HIGHWAYS AGENCY

Highways Agency Water Risk Assessment Tool version 1.0 November 2009

Soluble - Acute Impact

Annual Average Concentration

	Copper	Zinc	
Step 2	0.01	0.02	ug/l
Step 3	-	-	ug/l

Copper: Pass

Zinc: Pass

Sediment - Chronic Impact

Alert. Protected Area.

Sediment deposition for this site is judged as:

Accumulating?	No	0.85	Low flow Vel m/s
Extensive?	No	-	Deposition Index

Location Details

Road number	A1067 at Attlrbridge	HA Area / DBFO number	
Assessment type	Non-cumulative assessment (single outfall)		
OS grid reference of assessment point (m)	Easting	Northing	
OS grid reference of outfall structure (m)	Easting 612821	Northing 316737	
Outfall number	1	List of outfalls in cumulative assessment	
Receiving watercourse	Tibutary to River Wensum		
EA receiving water Detailed River Network ID		Assessor and affiliation	RD (MM)
Date of assessment	22/04/2014	Version of assessment	1
Notes	A1067 at Attlebridge		

Step 1 Runoff Quality AADT: >10,000 and <50,000 | Climatic region: Warm Dry | Rainfall site: Ipswich (SAAR 550mm)

Step 2 River Impacts

Annual 95%ile river flow (m^3/s): 0.1 (Enter zero in Annual 95%ile river flow box to assess Step 1 runoff quality only)

Impermeable road area drained (ha): 1.4 | Permeable area draining to outfall (ha): 0

Base Flow Index (BFI): 0.5 D | Is the discharge in or within 1 km upstream of a protected site for conservation? Yes

For dissolved zinc only Water hardness: High = >200mg CaCO3/l

For sediment impact only Is there a downstream structure, lake, pond or canal that reduces the velocity within 100m of the point of discharge? No D

Tier 1 Estimated river width (m): 1

Tier 2 Bed width (m): 3 | Manning's n: 0.07 D | Side slope (m/m): 0.5 | Long slope (m/m): 0.0001

Step 3 Mitigation

	Brief description	Estimated effectiveness: Treatment for solubles (%)	Attenuation for solubles - restricted discharge rate (l/s)	Settlement of sediments (%)
Existing measures		0 D	Unlimited D	0 D
Proposed measures		0 D	Unlimited D	0 D

Predict Impact

Show Detailed Results

Exit Tool

HIGHWAYS AGENCY

View Spillage Assessment Parameters | Reset | Go To Runoff Risk Assessment Interface

Assessment of Priority Outfalls

Method D - assessment of risk from accidental spillage

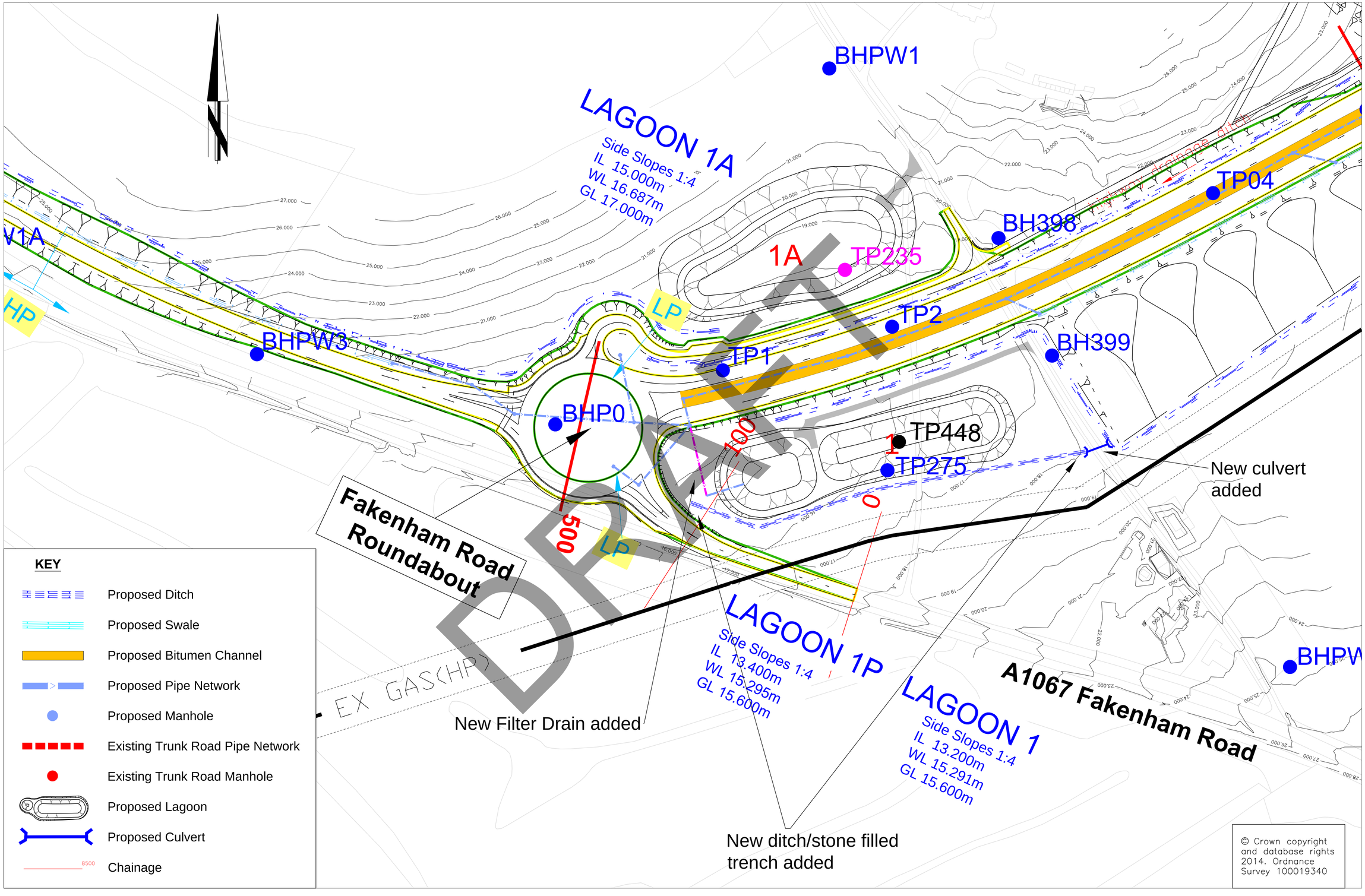
		A (main road)	B	C	D	E	F	Totals	Return Period (years)
		Additional columns for use if other roads drain to the same outfall							
D1	Water body type	Surface watercourse	Surface watercourse						
D2	Length of road draining to outfall *(m)*	1,114	100						
D3	Road Type *(A-road or Motorway)*	A	A						
D4	If A road, is site urban or rural?	Rural	Rural						
D5	Junction type	Side road	No junction						
D6	Location	< 1 hour	< 1 hour						
D7	Traffic flow (AADT two way)	19,915	19,915						
D8	% HGV	4.2	4.2						
D8	Spillage factor *(no/10^9HGVkm/year)*	0.93	0.29						
D9	Risk of accidental spillage	0.00032	0.00001	0.00000	0.00000	0.00000	0.00000		
D10	Probability factor	0.60	0.60						
D11	Risk of pollution incident	0.00019	0.00001	0.00000	0.00000	0.00000	0.00000		
D12	Is risk greater than 0.01?	**No**	**No**						
D13	Return period without pollution reduction measures	0.00019	0.00001	0.00000	0.00000	0.00000	0.00000	0.0002	5126
D14	Existing measures factor	1	1						
D15	Return period with existing pollution reduction measures	0.00019	0.00001	0.00000	0.00000	0.00000	0.00000	0.0002	5126
D16	Proposed measures factor	1	1						
D17	Residual with proposed Pollution reduction measures	0.00019	0.00001	0.00000	0.00000	0.00000	0.00000	0.0002	5126

Table C.2: Groundwater risk and impact assessment table - Swales

	Road chainage (m)														
									> Impact assessment (potential change in groundwater quality)						
Drainage catchment number	Start	Finish	Description of geology at base of swale (top of crag elevation given where possible)	Min Swale Invert Level (mAOD)	Max GW Level (mAOD)	Shallowest depth of unsaturated zone (m)	GW Risk score	Spillage Risk	Feature	Attributes	Importance	Mitigation proposed (Operation)	Magnitude (without lining)	Potential significance of Effect (without lining)	Swale lining required?
CA1	-223	200	Crag over upper chalk (Highest at 18.24mAOD at PW3)	19.71	9.95	9.76	185	<0.005	Principal aquifer (Chalk/Crag)	River Wensum SAC	Very high (Principal aquifer supporting SAC)	Unsaturated zone >1.5m below base of swale providing filtering and adsorption of metals/PAH/TSS. Swale provides a 40% spillage risk reduction factor.	Minor adverse/ Negligible	Moderate adverse	**Yes (potential adverse effect)**

Figure C.3: Groundwater risk assessment matrix – Drainage Catchment CA1

Component Number		Weighting Factor	Property or parameter	Site data	Risk score	Component score
1	Source	15	**Traffic density**	<50,000 AADT	1	15
2		15	**Rainfall Volume**	<740mm rainfall	1	15
		15	**Rainfall Intensity**	Uneven (35-47mm FEH 1 hour rainfall)	2	30
3	Pathway	15	**Soakaway geometry**	Single Point, or shallow soakaway (e.g. lagoon) serving low road	2	30
4		20	**Unsaturated zone**	Depth to water table <15>5m	2	40
5		20	**Flow type**	Consolidated deposits (i.e. mixed fracture and intergranular flo	2	40
6		7.5	**Effective grain size**	Fine sand and below	1	7.5
7		7.5	**Lithology**	<1% clay minerals	3	22.5
					Overall Risk Score	185



KEY

- Proposed Ditch
- Proposed Swale
- Proposed Bitumen Channel
- Proposed Pipe Network
- Proposed Manhole
- Existing Trunk Road Pipe Network
- Existing Trunk Road Manhole
- Proposed Lagoon
- Proposed Culvert
- Chainage (8500)

Norfolk County Council
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Birse Civils

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

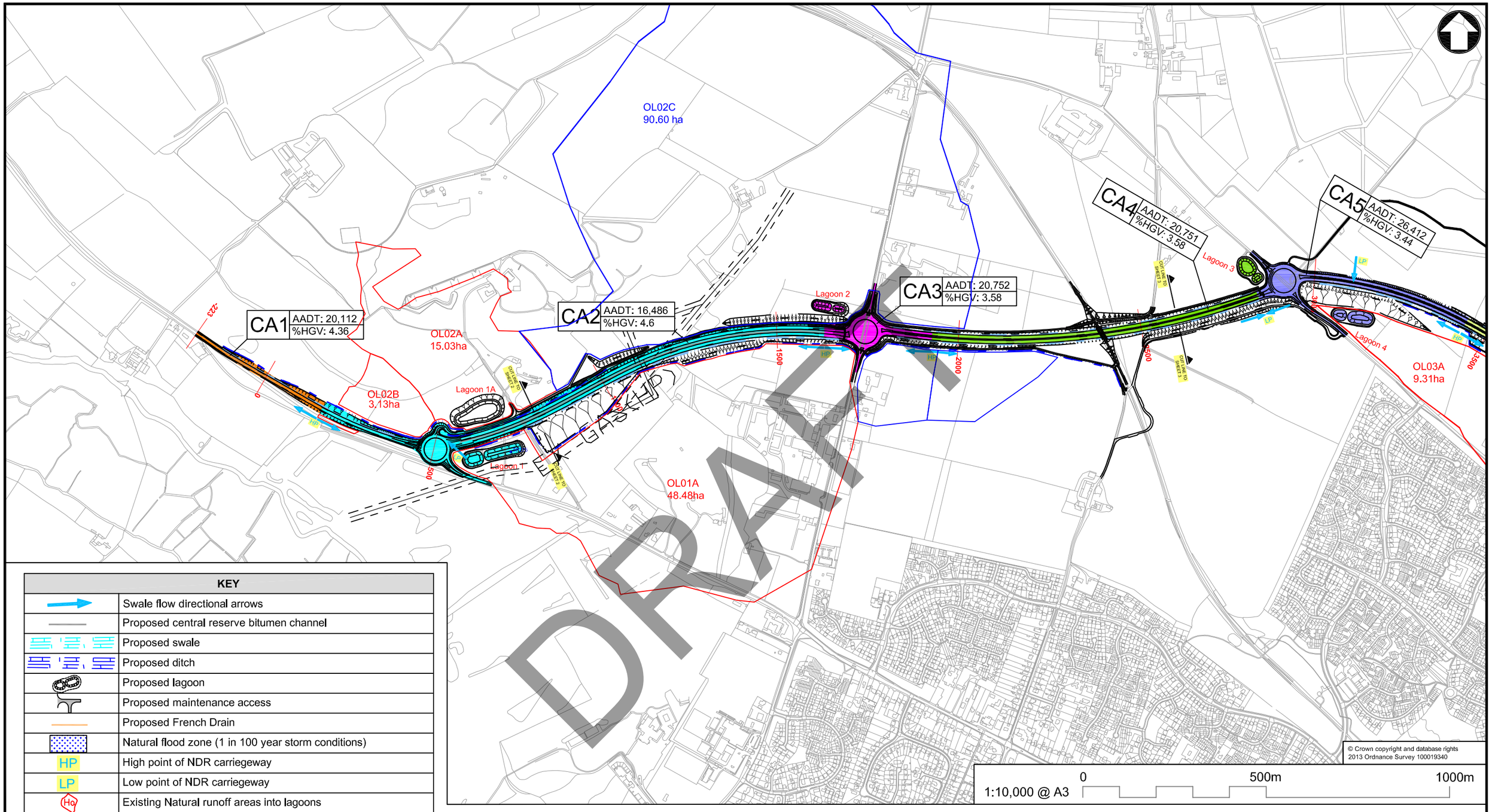
DRAWING TITLE
NORWICH NORTHERN DISTRIBUTOR ROAD
AMENDMENTS TO OVERLAND FLOWS
DITCHES AND CULVERTS

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	2014
DESIGNED BY	JC	06/14
DRAWN BY	JC	06/14
CHECKED BY	MKu	06/14

DRAWING No. R1C093-R1-4951
PROJECT TITLE: Norwich Northern Distributor Road
SCALE 1:1500
FILE No. R1C093

ORIGINAL SIZE: A3



KEY	
	Swale flow directional arrows
	Proposed central reserve bitumen channel
	Proposed swale
	Proposed ditch
	Proposed lagoon
	Proposed maintenance access
	Proposed French Drain
	Natural flood zone (1 in 100 year storm conditions)
HP	High point of NDR carriegeway
LP	Low point of NDR carriegeway
Ha	Existing Natural runoff areas into lagoons
Ha	Existing Natural runoff areas not into lagoons
or	Carriegeway runoff - Impermeable areas

1:10,000 @ A3 — 0 — 500m — 1000m

Drainage Catchment Area (CA)	Annual Average Daily Traffic (AADT)
	% Heavy Goods Vehicle (HGV)

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Norfolk County Council

Rev	Date	Drawn	Description	Ch'k'd	App'd
0	11/13	EMC	Revision for Submission	RB	PR

Title

Norwich Northern Distributor Road

Drainage Design

1 of 1

Drawn	EMC
Checked	RD
Approved	PR
Scale at A3	1:10,000
Drawing Number	MMD-233906-DT-0981
Rev	0
Status	INF

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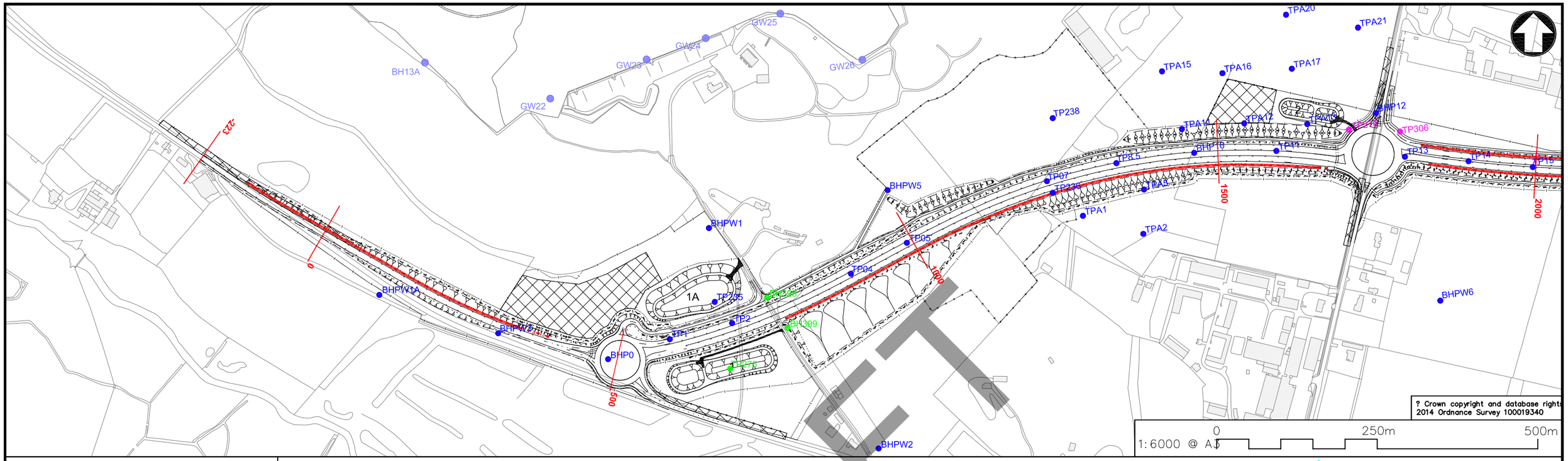
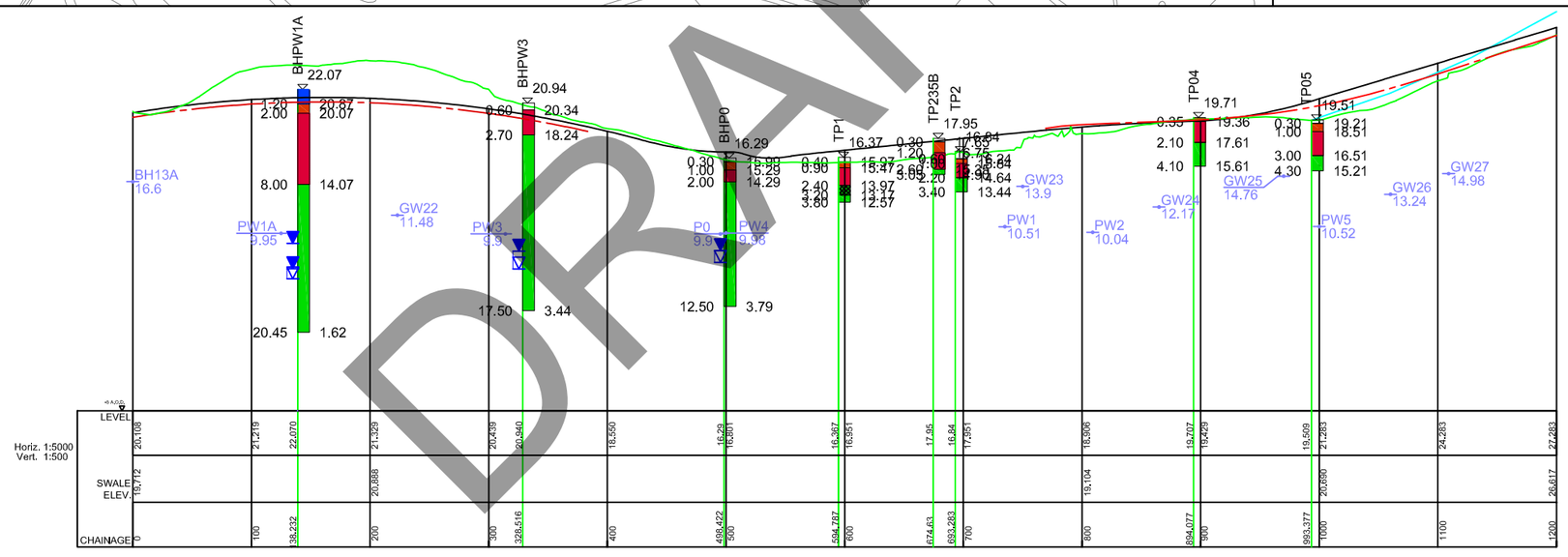
eas40619



- TOPSOIL
- MADE GROUND
- HEAD
- COVER SILT
- ALLUVIUM
- GLACIAL SAND AND GRAVEL
- LOWESTOFT TILL
- CORTON FORMATION SAND
- CORTON TILL
- CRAG
- VARIED CHALK
- UPPER CHALK

- INITIAL WATER STRIKE LEVEL
- SETTLED WATER STRIKE LEVEL AFTER APPROX. 20 MINUTES
- BOREHOLE MAXIMUM GROUNDWATER LEVEL (mAOD)
- PROPOSED SWALES



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1:5000 @ A3

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Rev	Date	Drawn	Description	Ch'k'd	App'd
0	11/13	AW	Revision for Submission	BD	SA
A	02/14	AW	Revision for stakeholder consultation	BD	SA

Title

Norwich Northern Distributor Road
Geological Long Section
Within 50m of NDR

1 of 1

Drawn	AW
Checked	BD
Approved	SA
Scale at A3	As Above
Drawing Number	MMD-233906-DT-0815
Rev	A
Status	INF

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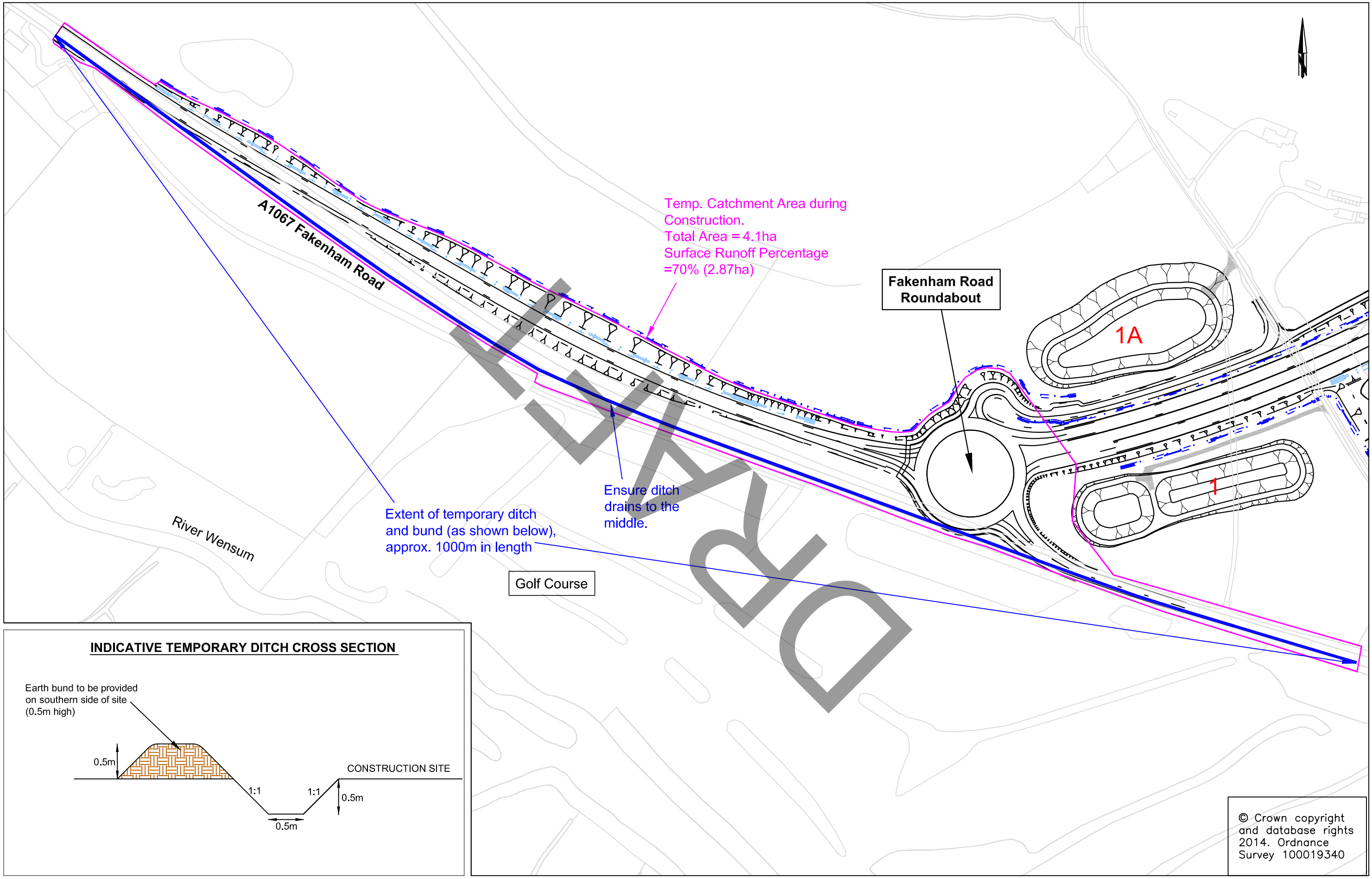
Appendix D. A1067 temporary ditch & MicroDrainage results



INDICATIVE TEMPORARY DITCH CROSS SECTION

Norfolk County Council
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Birse Civils

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Interim Director of Environment, Transport and Development
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Norwich NR1 2SG

DRAWING TITLE
NORWICH NORTHERN DISTRIBUTOR ROAD
TEMPORARY DITCH DURING CONSTRUCTION
FAKENHAM ROAD

REV.	DESCRIPTION	CHECKED	DATE
A	Ditch extended, text added		03/14

	INITIALS	DATE
SURVEYED BY	O.S	02/14
DESIGNED BY	JT	02/14
DRAWN BY	JT	02/14
CHECKED BY	MKu	02/14

DRAWING No. R1C093-R1-4399A
PROJECT TITLE Norwich Northern Distributor Road
SCALE 1:2500/500
FILE No. R1C093

ORIGINAL SIZE: A3

Summary of Results for 10 year Return Period

Half Drain Time : 910 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	24.389	0.389	6.9	368.3	O K
30 min Summer	24.452	0.452	7.0	428.1	O K
60 min Summer	24.520	0.520	7.0	493.4	O K
120 min Summer	24.591	0.591	7.1	560.6	O K
180 min Summer	24.630	0.630	7.1	597.4	O K
240 min Summer	24.655	0.655	7.1	620.5	O K
360 min Summer	24.680	0.680	7.2	644.9	O K
480 min Summer	24.689	0.689	7.2	653.6	O K
600 min Summer	24.689	0.689	7.2	653.1	O K
720 min Summer	24.683	0.683	7.2	647.1	O K
960 min Summer	24.687	0.687	7.2	651.1	O K
1440 min Summer	24.684	0.684	7.2	648.1	O K
2160 min Summer	24.668	0.668	7.1	633.1	O K
2880 min Summer	24.645	0.645	7.1	611.7	O K
4320 min Summer	24.546	0.546	7.1	517.9	O K
5760 min Summer	24.457	0.457	7.0	433.0	O K
7200 min Summer	24.377	0.377	6.9	357.3	O K
8640 min Summer	24.306	0.306	6.9	290.2	O K
10080 min Summer	24.245	0.245	6.8	232.5	O K
15 min Winter	24.436	0.436	7.0	413.2	O K
30 min Winter	24.507	0.507	7.0	481.0	O K
60 min Winter	24.586	0.586	7.1	555.5	O K
120 min Winter	24.668	0.668	7.1	633.6	O K
180 min Winter	24.715	0.715	7.2	677.8	O K
240 min Winter	24.745	0.745	7.2	706.5	O K
360 min Winter	24.780	0.780	7.2	739.6	O K
480 min Winter	24.796	0.796	7.2	754.9	O K
600 min Winter	24.802	0.802	7.2	760.1	O K
720 min Winter	24.800	0.800	7.2	758.7	O K
960 min Winter	24.809	0.809	7.3	766.5	O K
1440 min Winter	24.799	0.799	7.2	757.6	O K
2160 min Winter	24.772	0.772	7.2	731.6	O K
2880 min Winter	24.732	0.732	7.2	693.6	O K
4320 min Winter	24.582	0.582	7.1	551.9	O K
5760 min Winter	24.447	0.447	7.0	424.0	O K
7200 min Winter	24.329	0.329	6.9	312.1	O K
8640 min Winter	24.229	0.229	6.8	217.2	O K
10080 min Winter	24.148	0.148	6.7	140.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	69.778	0.0	23
30 min Summer	40.919	0.0	37
60 min Summer	23.995	0.0	66
120 min Summer	14.071	0.0	126
180 min Summer	10.298	0.0	186
240 min Summer	8.252	0.0	244
360 min Summer	6.039	0.0	364
480 min Summer	4.839	0.0	482
600 min Summer	4.075	0.0	600
720 min Summer	3.541	0.0	700
960 min Summer	2.899	0.0	812
1440 min Summer	2.187	0.0	1070
2160 min Summer	1.650	0.0	1476
2880 min Summer	1.351	0.0	1904
4320 min Summer	0.974	0.0	2720
5760 min Summer	0.773	0.0	3512
7200 min Summer	0.646	0.0	4248
8640 min Summer	0.557	0.0	5008
10080 min Summer	0.492	0.0	5656
15 min Winter	69.778	0.0	22
30 min Winter	40.919	0.0	37
60 min Winter	23.995	0.0	66
120 min Winter	14.071	0.0	124
180 min Winter	10.298	0.0	182
240 min Winter	8.252	0.0	240
360 min Winter	6.039	0.0	356
480 min Winter	4.839	0.0	470
600 min Winter	4.075	0.0	584
720 min Winter	3.541	0.0	694
960 min Winter	2.899	0.0	908
1440 min Winter	2.187	0.0	1144
2160 min Winter	1.650	0.0	1608
2880 min Winter	1.351	0.0	2076
4320 min Winter	0.974	0.0	2940
5760 min Winter	0.773	0.0	3744
7200 min Winter	0.646	0.0	4472
8640 min Winter	0.557	0.0	5192
10080 min Winter	0.492	0.0	5848

Model Details

Storage is Online Cover Level (m) 25.000

Infiltration Basin Structure

Invert Level (m) 24.000 Infiltration Coefficient Side (m/hr) 0.05040 Porosity 1.00
Infiltration Coefficient Base (m/hr) 0.05040 Safety Factor 2.0

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	948.0	1.000	948.0	2.000	0.0	3.000	0.0	4.000	0.0	5.000	0.0
0.200	948.0	1.200	0.0	2.200	0.0	3.200	0.0	4.200	0.0		
0.400	948.0	1.400	0.0	2.400	0.0	3.400	0.0	4.400	0.0		
0.600	948.0	1.600	0.0	2.600	0.0	3.600	0.0	4.600	0.0		
0.800	948.0	1.800	0.0	2.800	0.0	3.800	0.0	4.800	0.0		

Appendix E. Natura 2000, SSSI and Ramsar site information

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

1. Name and address of the compiler of this form:

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough
Cambridgeshire PE1 1JY
UK
Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948
Email: RIS@JNCC.gov.uk

2. Date this sheet was completed/updated:

Designated: 21 September 1994

3. Country:

UK (England)

4. Name of the Ramsar site:

Broadland

5. Designation of new Ramsar site or update of existing site:

This RIS is for: Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area:

** Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. Map of site included:

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no* □;
ii**) an electronic format** (e.g. a JPEG or ArcView image) Yes
iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✓ -or- *no* □;

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

8. Geographical coordinates (latitude/longitude):

52 43 56 N 01 36 00 E

9. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Great Yarmouth

Located in eastern Norfolk, part of East Anglia.

Administrative region: Norfolk; Suffolk

10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 5488.61

Min. -2
Max. 4
Mean 1

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Broadland is a low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The open distinctive landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow. The region is important for recreation, tourism, agriculture and wildlife.

13. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

2, 6

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 2

The site supports a number of rare species and habitats within the biogeographical zone context, including the following Habitats Directive Annex I features:

H7210	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	Calcium-rich fen dominated by great fen sedge (saw sedge).
H7230	Alkaline fens	Calcium-rich springwater-fed fens.
H91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	Alder woodland on floodplains,
and the Annex II species		
S1016	*Vertigo moulinsiana*	Desmoulin`s whorl snail
S1355	*Lutra lutra*	Otter
S1903	*Liparis loeselii*	Fen orchid.

The site supports outstanding assemblages of rare plants and invertebrates including nine British Red Data Book plants and 136 British Red Data Book invertebrates.

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in winter:

Tundra swan , *Cygnus columbianus bewickii*, NW Europe	196 individuals, representing an average of 2.4% of the GB population (5 year peak mean 1998/9-2002/3)
Eurasian wigeon , *Anas penelope*, NW Europe	6769 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)
Gadwall , *Anas strepera strepera*, NW Europe	545 individuals, representing an average of 3.1% of the GB population (5 year peak mean 1998/9-2002/3)
Northern shoveler , *Anas clypeata*, NW & C Europe	247 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)

Species/populations identified subsequent to designation for possible future consideration under criterion 6.

Species with peak counts in winter:

Pink-footed goose , *Anser brachyrhynchus*, Greenland, Iceland/UK	4263 individuals, representing an average of 1.7% of the population (5 year peak mean 1998/9-2002/3)
Greylag goose , *Anser anser anser*, Iceland/UK, Ireland	1007 individuals, representing an average of 1.1% of the population (Source period not collated)

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Atlantic

b) biogeographic regionalisation scheme (include reference citation):

Council Directive 92/43/EEC

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	acidic, basic, neutral, clay, alluvium, peat, nutrient-rich, sedimentary
Geomorphology and landscape	lowland, valley, floodplain
Nutrient status	eutrophic, highly eutrophic, mesotrophic, oligotrophic
pH	acidic, alkaline, circumneutral
Salinity	brackish / mixosaline, fresh
Soil	mainly mineral, mainly organic
Water permanence	usually permanent, usually seasonal / intermittent
Summary of main climatic features	Annual averages (Lowestoft, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/lowestoft.html) Max. daily temperature: 13.0° C Min. daily temperature: 7.0° C Days of air frost: 27.8 Rainfall: 576.3 mm Hrs. of sunshine: 1535.5

General description of the Physical Features:

Broadland is a low-lying wetland complex in eastern England. The Broads are a series of flooded medieval peat cuttings within the floodplains of five principal river systems. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The distinctive open landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow, forming one of the finest marshland complexes in the UK. The differing types of management of the vegetation for reed, sedge and marsh hay, coupled with variations in hydrology and substrate, support an extremely diverse range of plant communities.

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

Broadland is a low-lying wetland complex in eastern England. The Broads are a series of flooded medieval peat cuttings within the floodplains of five principal river systems. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The distinctive open landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow, forming one of the finest marshland complexes in the UK.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Recharge and discharge of groundwater, Flood water storage / desynchronisation of flood peaks, Maintenance of water quality (removal of nutrients)

19. Wetland types:

Inland wetland

Code	Name	% Area
U	Peatlands (including peat bogs swamps, fens)	30
Tp	Freshwater marshes / pools: permanent	30
W	Shrub-dominated wetlands	15
Xf	Freshwater, tree-dominated wetlands	10
O	Freshwater lakes: permanent	10
Q	Saline / brackish lakes: permanent	3
M	Rivers / streams / creeks: permanent	2

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The peatland areas of this site support: alder woodland on the floodplain dominated by *Alnus glutinosa* and the *Betula-Dryopteris cristata* community; mixed tall-herb fen typical of calcareous conditions are dominated by *Phragmites australis* and *Cladium mariscus*. The very wet mires are dominated by *Carex* spp. and *Juncus* spp., and spring-fed fens with *Schoenus nigricans*, *Carex dioica* and *Pinguicula nigricans*. Open waters are mostly highly eutrophic; however, some plant-rich mesotrophic and eutrophic examples remain, dominated by *Chara* sp., *Najas marina* and *Ceratophyllum demersum*. The ditch systems within the drained grasslands support Magnopotamion and Hydrocharition vegetation, often with *Stratiotes aloides*.

Ecosystem services

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Nationally important species occurring on the site.

Higher Plants.

Nationally Rare:

S1903 *Liparis loeselii* Fen orchid.

S1831 *Luronium natans* Floating water-plantain.

Najas marina, *Potamogeton acutifolius*, *Dryopteris cristata*

Nationally Scarce: *Althaea officinalis, Dactylorhiza traunsteineri, Potamogeton compressus, Potamogeton trichoides, Pyrola rotundifolia, Sonchus palustris, Cicuta virosa, Carex appropinquata, Thelypteris palustris, Lathyrus palustris, Potamogeton coloratus, Sium latifolium, Stratiotes aloides, Myriophyllum verticillatum.*

Lower Plants.

Nationally Rare: *Chara intermedia, Nitellopsis obtusa*, *Chara connivens, Chara intermedia* and *Cinclodium stygium*

Nationally scarce: *Chara curta, Drepanocladus vernicosus, Chara pendunculata, Campylium elodes, Chara aspera, Ricciocarpus natans, Tolypella glomerata*.

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Birds

Species currently occurring at levels of national importance:

Species regularly supported during the breeding season:

Eurasian marsh harrier , *Circus aeruginosus*, Europe	16 pairs, representing an average of 10.5% of the GB population (5 year mean 1987/8-1991/2)

Species with peak counts in spring/autumn:

Common coot , *Fulica atra atra*, NW Europe	3112 individuals, representing an average of 1.7% of the GB population (5 year peak mean 1998/9-2002/3)

Species with peak counts in winter:

Great cormorant , *Phalacrocorax carbo carbo*, NW Europe	273 individuals, representing an average of 1.1% of the GB population (5 year peak mean 1998/9-2002/3)
Great bittern , *Botaurus stellaris stellaris*, W Europe, NW Africa	2 individuals, representing an average of 2% of the GB population (5 year peak mean 1998/9-2002/3)
Bean goose , *Anser fabalis fabalis*, NW Europe - wintering	238 individuals, representing an average of 59.5% of the GB population (5 year peak mean for 1996/7-2000/01)
Greater white-fronted goose , *Anser albifrons albifrons*, NW Europe	351 individuals, representing an average of 6% of the GB population (Source period not collated)
Eurasian teal , *Anas crecca*, NW Europe	2934 individuals, representing an average of 1.5% of the GB population (5 year peak mean 1998/9-2002/3)
Common pochard , *Aythya ferina*, NE & NW Europe	800 individuals, representing an average of 1.3% of the GB population (5 year peak mean 1998/9-2002/3)
Smew , *Mergellus albellus*, NW & C Europe	10 individuals, representing an average of 2.7% of the GB population (5 year peak mean 1998/9-2002/3)
Hen harrier, *Circus cyaneus*, Europe	22 individuals, representing an average of 2.9% of the GB population (5 year peak mean 1987/8-1991/2)
Water rail , *Rallus aquaticus*, Europe	23 individuals, representing an average of 5.1% of the GB population (5 year peak mean 1998/9-2002/3)
Ruff , *Philomachus pugnax*, Europe/W Africa	82 individuals, representing an average of 11.7% of the GB population (5 year peak mean 1998/9-2002/3)

Species Information

Species occurring at levels of international importance.

Invertebrates.

S1016 *Vertigo moulinsiana* Desmoulin`s whorl snail

Assemblage.

This site supports a diverse assemblage of invertebrates including:
Aeshna isosceles, Papilio machaon britannicus.
136 British Red Data Book invertebrate species have been recorded on the site.

Nationally important species occurring on the site.

Mammals.

S1355 *Lutra lutra* Otter

23. Social and cultural values:

Describe if the site has any general social and/or cultural values e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

Aesthetic
Aquatic vegetation (e.g. reeds, willows, seaweed)
Archaeological/historical site
Environmental education/ interpretation
Fisheries production
Forestry production
Livestock grazing
Non-consumptive recreation
Scientific research
Sport fishing
Sport hunting
Tourism
Transportation/navigation

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning? No

If Yes, describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

Ownership category	On-site	Off-site
Non-governmental organisation (NGO)	+	
Local authority, municipality etc.	+	
National/Crown Estate	+	

Private	+	+

25. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	+
Collection of non-timber natural products: commercial	+	
Commercial forestry	+	+
Cutting/coppicing for firewood/fuel	+	+
Cutting of vegetation (small-scale/subsistence)	+	+
Fishing: commercial	+	+
Fishing: recreational/sport	+	+
Permanent arable agriculture		+
Rough or shifting grazing	+	+
Permanent pastoral agriculture	+	+
Hay meadows	+	+
Hunting: recreational/sport	+	+
Sewage treatment/disposal		+
Flood control	+	+
Irrigation (incl. agricultural water supply)		+
Mineral exploration (excl. hydrocarbons)		+
Transport route		+
Domestic water supply		+
Urban development		+
Non-urbanised settlements		+

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Explanation of reporting category:

1. *Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.*
2. *Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.*

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
No factors reported	NA				

For category 2 factors only. What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?
Is the site subject to adverse ecological change? NO

27. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	
National Nature Reserve (NNR)	+	
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	+
Management agreement	+	+
Site management statement/plan implemented	+	
Other	+	+
Environmentally Sensitive Area (ESA)	+	+
Special Area of Conservation (SAC)	+	

b) Describe any other current management practices:
The management of Ramsar sites in the UK is determined by either a formal management plan or through other management planning processes, and is overseen by the relevant statutory conservation agency. Details of the precise management practises are given in these documents.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

29. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Contemporary.

Flora.
The entire site has had a vegetation survey, primarily fen, wet woodland and open water areas, lakes plus ditch systems, and this is now on GIS.
Monitoring is undertaken on the site, particularly freshwater and fen habitats.

Completed.

Fauna.
Wintering and breeding bird survey of all drained marshland area completed, results on a GIS.
Some species survey and monitoring, e.g. *Liparis loeselii*, *Luronium natans* and a number of molluscs.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Many nature trails and footpaths with information boards and leaflets plus five visitor centres at Ranworth, Hickling, Strumpshaw, How Hill and Carlton Colville.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Activities.

The area attracts large numbers of tourists predominantly during the summer, many of which are water-borne. The river and broads (lakes) both within and adjacent to the site carry large numbers of power and sail craft which results in large-scale erosion and loss of fringing reedswamp. Speed limits have been imposed, however boat numbers remains too high.

Facilities provided.

Land-based recreation within the site is well managed, directing people to facilities where boardwalks are provided.

Seasonality.

All year.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Head, Natura 2000 and Ramsar Team, Department for Environment, Food and Rural Affairs, European Wildlife Division, Zone 1/07, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6EB

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Site Designations Manager, English Nature, Sites and Surveillance Team, Northminster House, Northminster Road, Peterborough, PE1 1UA, UK

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see **15** above), list full reference citation for the scheme.

Site-relevant references

Aldridge, DC & Müller, SJ (2001) The Asiatic clam, *Corbicula fluminea*, in Britain: current status and potential impacts. *Journal of Conchology*, **37**(2), 177-183

Baker, R, Clarke, K & Howlett, D (1999) A survey of the Broadland distribution of *Pseudamnicola confusa* (Frauenfeld). *English Nature Research Reports*, No. **319**

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81. Broadland

Geographical Coordinates: 52°43'N 1°31'W **Area:** 3,350ha

Location: A wetland complex in the valleys of the Yare, Bure, Ant and Thurne Rivers, east and northeast of the city of Norwich, in the county of Norfolk, eastern England.

Date of Ramsar Designation: 21 September 1994

Other International Designations: European Union Special Protection Area

National Designations: National nature reserve[P], Site of special scientific interest; Eutrophic sensitive area[P]

Principal Features: Broadland is located within a large area of low-lying land in east Norfolk and northern Suffolk, including the lower valleys of the Waveney, Yare and Bure rivers and their tributaries. The region possesses extensive peatlands containing a series of shallow lakes created in medieval times following the excavation of peat for fuel. A subsequent rise in sea level caused flooding and the pits were abandoned. The succession of vegetation and various forms of traditional management have resulted in the large range of wetland habitats now present, including open water, reedbeds, fen meadow and carr woodland. In the lower river valleys, the extensive areas of alluvial soils are traditionally managed as wet grazing marsh. The diversity of wetland habitats supports an outstanding assemblage of breeding and wintering wetland bird species, as well as large numbers of rare plants and invertebrates. The following nine species of Red Data Book plants are found within the proposed Ramsar site: the stoneworts *Nitellopsis obtusa*, *Chara intermedia*, and *C. connivens*, the bryophyte *Ricciocarpus natans*, the moss *Cinclidium stygium*, the macrophytes *Naja marina*, *Liparis loeselii*, *Potamogeton acutifolius* and the fern *Dryopteris cristata*. Broadland's rich invertebrate fauna includes 136 Red Data Book species, reflecting the quality and diversity of wetland habitats present. The site is particularly notable for it's dragonfly fauna, including the Red Data Book *Aeshna isosceles*, and as the only location in Britain where the endemic race of the butterfly *Papilio machaon britannicus* breeds successfully. The site also supports internationally important numbers of the following species of wintering wildfowl (figures are five year peak means for the period 1987/88 to 1991/92) *Cygnus columbianus bewickii* (495); *Anas penelope* (8,966), *A. strepera* (486), and *A. clypeata* (675). Notable also are nationally important numbers of the following breeding birds: *Botaurus stellaris*, *Anas strepera*, *A. querquedula*, *A. clypeata*, *Aythya ferina*, *Circus aeruginosus*, *Locustella luscinioides*, *Cettia cetti* and *Panurus biarmicus*. (Criteria 1a,2a,3c).

Conservation Issues: Land uses at the site include arable agriculture, grazing, flood control, livestock watering hole/pond, sewage treatment, industrial water supply, recreation and tourism. The National Rivers Authority (NRA) is promoting a flood alleviation strategy. There will be an effect on the brackish communities in the dykes due to the reduced water levels. This is addressed in the strategic Environmental Assessment which recognises that the habitat will be difficult to recreate (if not impossible). The NRA have recognised that bank strengthening could adversely affect those areas which

lie outside the existing flood defences and are investigating the implementation of the bank strengthening in addition to the provision of defences or other methods to ensure that those areas are not disadvantaged. A programme of phosphate stripping from sewage works effluents, combined with pumping of nutrient rich sediments from eutrophic Broads, isolation of the main river systems and 'biomanipulation' (principally the removal of fish which are predators of zooplankton) is in place in parts of Broadland. This seeks to restore the ecological character of open water bodies. Natural vegetation succession in the reedbeds, which has in the past been limited by regular reedcutting, has led to long term drying out and scrub development. Breeding *Botaurus stellaris* are now limited to two sites. Booming males have ceased to occur at four other sites in recent years. Reedbed 'quality' investigations by the Royal Society for the Protection of Birds (RSPB) have ascribed these losses to habitat change, principally through the drying of sites by succession. The RSPB has restorative measures in hand at the sites that it manages. Both the Norfolk Naturalists' Trust and the Broads Authority also have reedbed restoration programmes in operation. A management plan for the Bure Marshes part of the site is being implemented by English Nature. As part of a fen management strategy, agreed between EN and the Broads Authority, for the whole of Broadland, a ten year programme of "turf ponding" has been initiated. This involves the creation of shallow pools through the removal of a layer of peat, simulating the habitats created by traditional peat cutting. These show significantly increased species diversity and, more importantly, rare plants and communities are promoted.

European Site Conservation Objectives for Broadland Special Protection Area Site Code: UK9009253

With regard to the individual species and/or assemblage of species for which the site has been classified ('the Qualifying Features' listed below);

Avoid the deterioration of the habitats of the qualifying features, and the significant disturbance of the qualifying features, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving the aims of the Birds Directive.

Subject to natural change, to maintain or restore:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The populations of the qualifying features;
- The distribution of the qualifying features within the site.

Qualifying Features:

A021 *Botaurus stellaris*; Great bittern (Breeding)
A037 *Cygnus columbianus bewickii*; Bewick's swan (Non-breeding)
A038 *Cygnus cygnus*; Whooper swan (Non-breeding)
A050 *Anas penelope*; Eurasian wigeon (Non-breeding)
A051 *Anas strepera*; Gadwall (Non-breeding)
A056 *Anas clypeata*; Northern shoveler (Non-breeding)
A081 *Circus aeruginosus*; Eurasian marsh harrier (Breeding)
A082 *Circus cyaneus*; Hen harrier (Non-breeding)
A151 *Philomachus pugnax*; Ruff (Non-breeding)

Additional Qualifying Features Identified by the 2001 UK SPA Review:

A021 *Botaurus stellaris*; Great bittern (Non-breeding)
A040 *Anser brachyrhynchus*; Pink-footed goose (Non-breeding)
Waterbird assemblage

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each bird feature for a Special Protection Area (SPA). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving the aims of the Birds Directive for those features. On the first page of this document there may be a list of 'Additional Qualifying Features identified by the 2001 UK SPA Review'. These are additional features identified by the UK SPA Review published in 2001 and, although not yet legally classified, are as a matter of Government policy treated in the same way as classified features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type J **1.2 Site code** UK9009253

1.3 Compilation date 199409 **1.4 Update** 199806

1.5 Relationship with other Natura 2000 sites

U	K	0	0	1	3	5	7	7

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name **Broadland**

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	199409
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	**latitude**
01 36 00 E	52 43 56 N

2.2 Site area (ha) 5462.4 **2.3 Site length (km)**

2.5 Administrative region

NUTS code	Region name	% cover
UK402	Norfolk	99.00%
UK403	Suffolk	1.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

		Population				Site assessment			
		Resident	Migratory						
Code	Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
A056	*Anas clypeata*			231 I		B		C	
A050	*Anas penelope*			10071 I		C		C	
A051	*Anas strepera*			240 I		B		C	
A021	*Botaurus stellaris*		>2 I			B		B	
A081	*Circus aeruginosus*		16 P			B		B	
A082	*Circus cyaneus*			22 I		B		C	
A037	*Cygnus columbianus bewickii*			>600 I		B		B	
A038	*Cygnus cygnus*			100 I		C		C	
A151	*Philomachus pugnax*			96 I		B		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	2.5
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	10.0
Bogs. Marshes. Water fringed vegetation. Fens	25.0
Heath. Scrub. Maquis and garrigue. Phygrana	13.0
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	41.0
Alpine and sub-alpine grassland	
Improved grassland	
Other arable land	
Broad-leaved deciduous woodland	8.5
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Basic, Clay, Nutrient-rich, Peat, Sedimentary

Geomorphology & landscape:

Floodplain, Lowland, Valley

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)

During the breeding season the area regularly supports:

Botaurus stellaris (Europe - breeding)	at least 10% of the GB breeding population Three year mean 1996-1998

Circus aeruginosus	10.2% of the GB breeding population 5 year mean, 1987/8-1991/2
Over winter the area regularly supports:	
Circus cyaneus	2.9% of the GB population 5 year peak mean 1987/8-1991/2
Cygnus columbianus bewickii (Western Siberia/North-eastern & North-western Europe)	at least 8.2% of the GB population Count, as at 1996/7
Cygnus cygnus (Iceland/UK/Ireland)	1.8% of the GB population Count, as at 1996/7

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

Over winter the area regularly supports:

Anas strepera (North-western Europe)	0.8% of the population 5 year peak mean, 1991/2-1995/6

4.3 Vulnerability

The site has suffered from management neglect and natural succession during this century. This is slowly being reversed via conservation and other management works undertaken through a number of bodies. Sea level rise and reduced summer flows in the river Bure brought about by abstraction are resulting in increasing saline intrusion into the site and generally drier summer conditions. The Environment Agency, Broads Authority and English Nature are proceeding with a project, to investigate options to remedy this situation. The site also suffers from eutrophication, brought through the build up of nutrients over a long period, primarily through sewage outfalls and, to a lesser degree, agriculture. Some of the sewage works are now stripping phosphorus and there is a programme of mud pumping to remove enriched material from lakes.

The region as a whole is a centre for tourism and recreation, however this pressure is now starting to be brought under control by the Broads Authority via the Broads Plan. Efficient drainage within much of the reclaimed parts of the wetland has reduced the wildlife value. Water Level Management Plans and the ESA scheme are starting to raise water levels, revert arable areas back to grass and encourage sensitive management, particularly of the ditches. Flood defence works are carried out in accordance with the Environmental Agency Broads Strategy.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK01 (NNR)	39.8
UK04 (SSSI/ASSI)	100.0

European Site Conservation Objectives for The Broads Special Area of Conservation Site code: UK0013577

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H3140. Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.; Calcium-rich nutrient-poor lakes, lochs and pools

H3150. Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation; Naturally nutrient-rich lakes or lochs which are often dominated by pondweed

H6410. *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*); Purple moor-grass meadows

H7140. Transition mires and quaking bogs; Very wet mires often identified by an unstable `quaking` surface

H7210. Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; Calcium-rich fen dominated by great fen sedge (saw sedge)*

H7230. Alkaline fens; Calcium-rich springwater-fed fens

H91E0. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*); Alder woodland on floodplains*

S1016. *Vertigo moulinsiana*; Desmoulin`s whorl snail

S1355. *Lutra lutra*; Otter

S1903. *Liparis loeselii*; Fen orchid

S4056. *Anisus vorticulus*; Little whorlpool ram's-horn snail

* denotes a priority natural habitat or species (supporting explanatory text on following page)

*** Priority natural habitats or species**

Some of the natural habitats and species listed in the Habitats Directive and for which SACs have been selected are considered to be particular priorities for conservation at a European scale and are subject to special provisions in the Directive and the Habitats Regulations. These priority natural habitats and species are denoted by an asterisk (*) in Annex I and II of the Directive. The term 'priority' is also used in other contexts, for example with reference to particular habitats or species that are prioritised in UK Biodiversity Action Plans. It is important to note however that these are not necessarily the priority natural habitats or species within the meaning of the Habitats Directive or the Habitats Regulations.

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type K **1.2 Site code** UK0013577

1.3 Compilation date 199601 **1.4 Update** 201102

1.5 Relationship with other Natura 2000 sites

U	K	9	0	0	9	2	5	3

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name **The Broads**

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	199601
date confirmed as SCI	200412
date site classified as SPA	
date site designated as SAC	200504

2. Site location:

2.1 Site centre location

longitude	**latitude**
01 36 13 E	52 44 07 N

2.2 Site area (ha) 5889.66 **2.3 Site length (km)**

2.5 Administrative region

NUTS code	Region name	% cover
UK403	Suffolk	3.27%
UK402	Norfolk	96.73%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment
Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	2.98	A	A	A	**A**
Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation	4.96	A	B	A	**B**
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	0.99	B	C	A	**C**
Transition mires and quaking bogs	0.1	B	C	A	**B**
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	3.55	A	A	A	**A**
Alkaline fens	0.1	A	C	A	**B**
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	12.96	A	B	A	**A**

3.2 Annex II species

		Population			Site assessment			
	Resident	Migratory						
Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
Vertigo moulinsiana	Present	-	-	-	C	A	C	**A**
Triturus cristatus	Present	-	-	-	D			
Lutra lutra	23	-	-	-	C	A	C	**C**
Liparis loeselii	251-500	-	-	-	C	B	A	**B**
Anisus vorticulus	Rare	-	-	-	B	B	C	**B**

4. Site description

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	16.0
Bogs. Marshes. Water fringed vegetation. Fens	19.0
Heath. Scrub. Maquis and garrigue. Phygrana	1.0
Dry grassland. Steppes	1.0
Humid grassland. Mesophile grassland	39.0
Alpine and sub-alpine grassland	
Improved grassland	
Other arable land	
Broad-leaved deciduous woodland	24.0
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Alluvium, Basic, Clay, Nutrient-poor, Nutrient-rich, Peat

Geomorphology & landscape:

Floodplain, Lowland, Valley

4.2 Quality and importance

Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- for which this is considered to be one of the best areas in the United Kingdom.

Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation
- for which this is considered to be one of the best areas in the United Kingdom.

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- for which the area is considered to support a significant presence.

Transition mires and quaking bogs
- for which this is considered to be one of the best areas in the United Kingdom.

Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
- which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 1000 hectares.
- for which this is considered to be one of the best areas in the United Kingdom.

Alkaline fens
- for which this is considered to be one of the best areas in the United Kingdom.

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
- for which this is considered to be one of the best areas in the United Kingdom.

Vertigo moulinsiana
- for which this is considered to be one of the best areas in the United Kingdom.

Lutra lutra
- for which the area is considered to support a significant presence.

Liparis loeselii
- for which this is one of only three known outstanding localities in the United Kingdom.
- which is known from 15 or fewer 10 x 10 km squares in the United Kingdom.

Anisus vorticulus
- for which this is considered to be one of the best areas in the United Kingdom.

4.3 Vulnerability

The site has suffered from management neglect and natural succession during the 20th century. This is slowly being reversed through conservation and other management works undertaken by a number of bodies. Climate change is increasing saline intrusion into the site. The Environment Agency, Broads Authority and Natural England are working together to make the site more robust to such impacts. The site also suffers from eutrophication caused by release of nutrients from the sediment (historically deposited by sewage outfalls) and diffuse water pollution from a variety of sources. All main sewage works in the northern rivers are now phosphorus stripping and there is a programme of mud-pumping to remove the historic nutrient burden from lakes. Diffuse Water Pollution (DWP) Plans have been drawn up between the Environment Agency and Natural England to identify and address the problems of diffuse water pollution. Pressure from tourism and recreation is now being considered by the Broads Authority through the Broads Plan. Water Level Management Plans and Environmental Stewardship schemes are starting to raise water levels, revert arable areas back to grass and encourage sensitive management, particularly of the ditches, to address problems brought about by drainage in the past. Appropriate standards of flood defence are necessary for the wetland and works are currently proceeding under the Environment Agency's Broadland Flood Alleviation Project and Coastal Protection Strategy.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK01 (NNR)	35.7
UK04 (SSSI/ASSI)	100.0

European Site Conservation Objectives for River Wensum Special Area of Conservation Site code: UK0012647

With regard to the natural habitats and/or species for which the site has been designated ('the Qualifying Features' listed below);

Avoid the deterioration of the qualifying natural habitats and the habitats of qualifying species, and the significant disturbance of those qualifying species, ensuring the integrity of the site is maintained and the site makes a full contribution to achieving Favourable Conservation Status of each of the qualifying features.

Subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

Qualifying Features:

H3260. Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; Rivers with floating vegetation often dominated by water-crowfoot

S1016. *Vertigo moulinsiana*; Desmoulin`s whorl snail

S1092. *Austropotamobius pallipes*; White-clawed (or Atlantic stream) crayfish

S1096. *Lampetra planeri*; Brook lamprey

S1163. *Cottus gobio*; Bullhead

Explanatory Notes: European Site Conservation Objectives

European Site Conservation Objectives are those referred to in the Conservation of Habitats and Species Regulations 2010 (the "Habitats Regulations") and Article 6(3) of the Habitats Directive 1992. They are for use when either the appropriate nature conservation body or competent authority is required to make an Appropriate Assessment under the relevant parts of the respective legislation.

These conservation objectives are set for each habitat or species of a Special Area of Conservation (SAC). Where the objectives are met, the site can be said to demonstrate a high degree of integrity and the site itself makes a full contribution to achieving favourable conservation status for those features.

This document is also intended for those who are preparing information to be used for an appropriate assessment by either the appropriate nature conservation body or a competent authority. As such this document cannot be definitive in how the impacts of a project can be determined. Links to selected sources of information, data and guidance which may be helpful can be found on Natural England's website. This list is far from exhaustive.

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type B **1.2 Site code** UK0012647

1.3 Compilation date 200103 **1.4 Update**

1.5 Relationship with other Natura 2000 sites

1.6 Respondent(s) International Designations, JNCC, Peterborough

1.7 Site name **River Wensum**

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	200103
date confirmed as SCI	200412
date site classified as SPA	
date site designated as SAC	200504

2. Site location:

2.1 Site centre location

longitude	**latitude**
00 59 38 E	52 43 04 N

2.2 Site area (ha) 381.74 **2.3 Site length (km)**

2.5 Administrative region

NUTS code	Region name	% cover
UK402	Norfolk	100.00%

2.6 Biogeographic region

Alpine	Atlantic	Boreal	Continental	Macaronesia	Mediterranean
	X				

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	20	B	C	B	**B**
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	0.5	D			
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	0.5	D			

3.2 Annex II species

	Population				Site assessment			
	Resident	Migratory						
Species name		Breed	Winter	Stage	Population	Conservation	Isolation	Global
Vertigo moulinsiana	Common	-	-	-	C	B	C	**C**
Austropotamobius pallipes	Common	-	-	-	C	B	B	**B**
Lampetra planeri	Common	-	-	-	C	B	C	**C**
Cottus gobio	Common	-	-	-	C	B	C	**C**

4. Site description

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	42.0
Bogs. Marshes. Water fringed vegetation. Fens	12.0
Heath. Scrub. Maquis and garrigue. Phygrana	
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	40.0
Alpine and sub-alpine grassland	
Improved grassland	
Other arable land	
Broad-leaved deciduous woodland	6.0
Coniferous woodland	
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	**100%**

4.1 Other site characteristics

Soil & geology:

Alluvium, Basic, Clay, Neutral, Nutrient-rich, Peat, Sand, Sedimentary

Geomorphology & landscape:

Floodplain, Lowland, Valley

4.2 Quality and importance

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

- for which this is considered to be one of the best areas in the United Kingdom.

Vertigo moulinsiana

- for which the area is considered to support a significant presence.

Austropotamobius pallipes

- for which this is considered to be one of the best areas in the United Kingdom.

Lampetra planeri

- for which the area is considered to support a significant presence.

Cottus gobio

- for which the area is considered to support a significant presence.

4.3 Vulnerability

A stepped profile, with alternating fast- and slow-moving reaches, was imposed on the river with the construction of water-mills. Habitat diversity has been reduced by the modification of the channel form. The input of silt and agricultural chemicals as a result of arable farming practices are a concern and the reversion of arable fields to low-input grassland should be encouraged. A strategy should be devised for silt management in the river and catchment to minimise disturbance to the channel and bankside. Further development on the flood plain might alter the flow regime of the river.
More detailed studies on groundwater resources should be carried out so as to determine suitable flow objectives to ensure that the river's ecology is not threatened by water abstraction. At adjacent sewage treatment works, phosphorous removal will be a statutory requirement by 2004. However, a holistic strategy is needed to identify further mechanisms for the control of eutrophication.
Any increase in the distribution of *Pacifastacus leniusculus* within the catchment would threaten the long-term viability of *Austropotamobius pallipes*. Populations of *Lampetra planeri* and *Cottus gobio* are dependent on the maintenance of riffle habitats and might also be vulnerable to the introduction of non-native fish species. Populations of *Vertigo moulinsiana* are susceptible to interference with the emergent bank-side vegetation in which they occur.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK04 (SSSI/ASSI)	100.0

Date of Notification: 4 February 1993

COUNTY: Norfolk SITE NAME: RIVER WENSUM

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981, section 17 of the Water Resources Act 1991, Section 4 of the Water Industry Act 1991 and Section 13 of the Land Drainage Act 1991.

National Rivers Authority Region: Anglian

International Drainage Board: River Wensum

Water Company: Anglian Water Plc

Local Planning Authorities: North Norfolk District Council, Norfolk County Council, Kings Lynn & West Norfolk District Council, South Norfolk District Council, Breckland District Council, Broadland District Council

National Grid Reference: TF 942246 to TG 250078

Length of River SSSI: Approx 71km Area: 393.31 (ha) 971.9 (ac)

Ordnance Survey Sheet 1:50,000: 132 133 134 1:10,000: TF 82 SE NE NW, TF 93 SE, TF 92 SE NE NW, TF 83 SE, TG 01 NE NW, TG 02 SW, TG 11 SE SW NW

Date of Notification (under 1981 Act): 1993

Other Information:
New site.

Description and Reasons for Notification:
Key features
The Wensum has been selected as one of a national series of rivers of special interest as an example of an enriched, calcareous lowland river. With a total of over 100 species of plants, a rich invertebrate fauna and a relatively natural corridor, it is probably the best whole river of its type in nature conservation terms, although short stretches of other similar rivers may show a slightly greater diversity of species.

The upper reaches are fed by springs that rise from the chalk and by run-off from calcareous soils rich in plant nutrients. This gives rise to dense beds of submerged and emergent vegetation characteristic of a chalk stream. Lower down, the chalk is overlain with boulder clay and river gravels, resulting in aquatic plant communities more typical of a slow-flowing river on mixed substrate. Diversity of plant species is further enhanced by mills and weirs; upstream the river slows to produce characteristic deep water plant communities, whilst below the barriers they are replaced by species tolerant of swirling and turbulent water.

Unusually for a lowland river in England, much of the adjacent land is still traditionally managed for hay crops and by grazing, giving a wide spectrum of grassland habitats some of which are seasonally inundated. The mosaic of meadow and marsh habitats, including one of the most extensive reedbeds in the country outside the Broads, provide niches for a wide variety of specialised plants and animals.

The River itself supports an abundant and diverse invertebrate fauna including the native freshwater crayfish *Austropotamobius pallipes* as well as a good mixed fishery. Brown trout *Salmo trutta fario* form the major component of the fish community of the upper

Wensum, whilst the middle and lower reaches are dominated by chub *Leuciscus cephalus*, pike *Esox lucius*, eel *Anguilla anguilla* and barbel *Barbus barbus*. Kingfisher *Alcedo attthis* and little grebe *Tachybaptus ruficollis* breed along the River, whilst the adjacent wetlands have good populations of reed warblers *Acrocephalus scirpaceus*, sedge warblers *Acrocephalus schoenobaenus* and barn owls *Tyto alba*.

Flora

In the upper reaches on gravel substrates lesser water-parsnip *Berula erecta* and the brook water-crowfoot *Ranunculus penicillatus* form a large component of the flora. Where silt has been deposited, spiked water milfoil *Myriophyllum spicatum*, blue water-speedwell *Veronica anagalis-aquatica*, opposite leaved pondweed *Groenlandia densa*, willow moss *Fontinalis antipyretica* and the nationally rare short-leaved starwort *Callitriche truncata* occur.

The middle and lower stretches of the river are characterised by rich lowland plant communities. The dominants are yellow water-lily *Nuphar lutea*, flowering rush *Butomus umbellatus*, fennel pondweed *Potamogeton pectinatus*, perfoliate pondweed *Potamogeton perfoliatus*, arrowhead *Sagittaria sagittifolia* and unbranched bur-reed *Sparganium erectum*. Variations in the aquatic plant community reflect the alternation of fast-flowing shallows with deep slow-moving water. Other species with widespread distribution along the Wensum include rigid hornwort *Ceratophyllum demersum*, spiked water-milfoil *Myriophyllum spicatum*, fan-leaved water-crowfoot *Ranunculus circinatus*, branched bur-reed *Sparganium erectum*, common club-rush *Scirpus lacustris*, horned pondweed *Zannichellia palustris* and the nationally scarce river water-dropwort *Oenanthe fluviatilis*.

The marginal and bankside communities are typical of lowland rivers. Often there are dense and continuous stands of reeds or sedges. Reed sweet-grass *Glyceria maxima* is dominant in the lower reaches. Elsewhere stands of reed canary-grass *Phalaris arundinacea*, greater pond-sedge *Carex riparia*, reedmace *Typha latifolia* and common reed *Phragmites australis* are widespread. Where edges are not dominated by tall emergents, stragling or low-growing herbs such as fool's water-cress *Apium nodiflorum*, water-mint *Mentha aquatica*, water forget-me-not *Myosotis scorpioides* and brooklime *Veronica becaabunga* occur.

Of the semi-natural habitats associated with the River, the most frequently occurring are acidic or neutral unimproved wet grasslands. The flora of these grasslands is typified at Helhoughton and Turf Common by bogbean *Menyanthes trifoliata*, marsh marigold *Caltha palustris*, yellow rattle *Rhinanthus minor*, ragged robin *Lychnis flos-cuculi*, southern marsh orchid *Dactylorhiza praetermissa*, common spotted orchid *Dactylorhiza fuchsii*, water mint *Mentha aquatica* and yellow iris *Iris pseudacorus*.

Elsewhere the land is seasonally inundated so that grazing is restricted; extensive areas of reedbed and tall mixed fen communities have developed which provide valuable breeding and hunting grounds for birds such as the barn owl *Tyto alba* and hen harrier *Circus cyaneus*. Examples include Guist Common which is reed dominated; Goggs Mill Reserve near Fakenham which has a mixed fen community with species such as meadowsweet *Filipendula ulmaria*, angelica *Angelica sylvestris* and meadow rue *Thalictrum flavum*, and Sculthorpe Moor, which although gradually being invaded by willow *Salix* spp. scrub has a fen community of saw sedge *Cladium mariscus* and black bog-rush *Schoenus nigricans*. Although there are several areas of alder swamp interspersed with the above communities, Guist Carr forms the main example of wet woodland within the SSSI.

All of the habitats within the SSSI are intrinsically linked to and dependent on the River for their continued existence. Appropriately, in times of drought, these adjacent wetlands have a vital role in buffering the river against low flows; in wetter periods they absorb river flood waters and become swamp-like in nature.

Two tributaries have been included in the SSSI, the Tat and the Langor Drain. They are both major flow contributors to the main river; historically, the Tat may have been the

original Wensum. The Langor valley comprises an extensive area of semi-natural habitat which is dominated by fen vegetation. The specific composition ranges from almost exclusively reed to a mixture of meadowsweet and sedge species. Parts of Little Ryburgh Common are grazed, having bittersweet *Solanum dulcamara,* branched bur-reed *Sparganium erectum,* water cress *Rorippa nasturtium-aquaticum,* greater tussock sedge *Carex paniculata,* lesser water parsnip *Berula erecta,* water mint *Mentha aquatica,* and marsh marigold *Caltha palustris* as elements in their flora. The vegetation of the drier areas of Little Ryburgh Common includes bracken *Pteridium aquilinum,* honeysuckle *Lonicera periclymenum,* field scabious *Knautia arvensis,* harebell *Campanula rotundifolia* and soft rush *Juncus effusus*.

Invertebrates

The Wensum has an abundant and diverse mollusc fauna which includes the nationally rare, small snail *Vertigo moulinsiana,* which is associated with aquatic vegetation at the river edge. Two other aquatic molluscs which occur, *Valvata piscinalis* and *Gyraulus albus,* have a localised distribution in England. Water beetles are well represented; *Brychnus elevatus,* of localised distribution in England, is found in deep slow-flowing sections of the river. The mayflies *Ephemerella ignita, Caenis luctuosa, Centroptilium luteolum* and *Centroptilium pennulatum* are also of local distribution. There is a species of stonefly, *Amphinemura standfussi,* more usually associated with upland rivers. The flatworm *Crenobia alpina* is of note, being a relict in southern England where it is confined to cold-water springs.

SSSI home
New notifications
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Reports and statistics
SSSI glossary

Sites of Special Scientific Interest

SSSI unit information

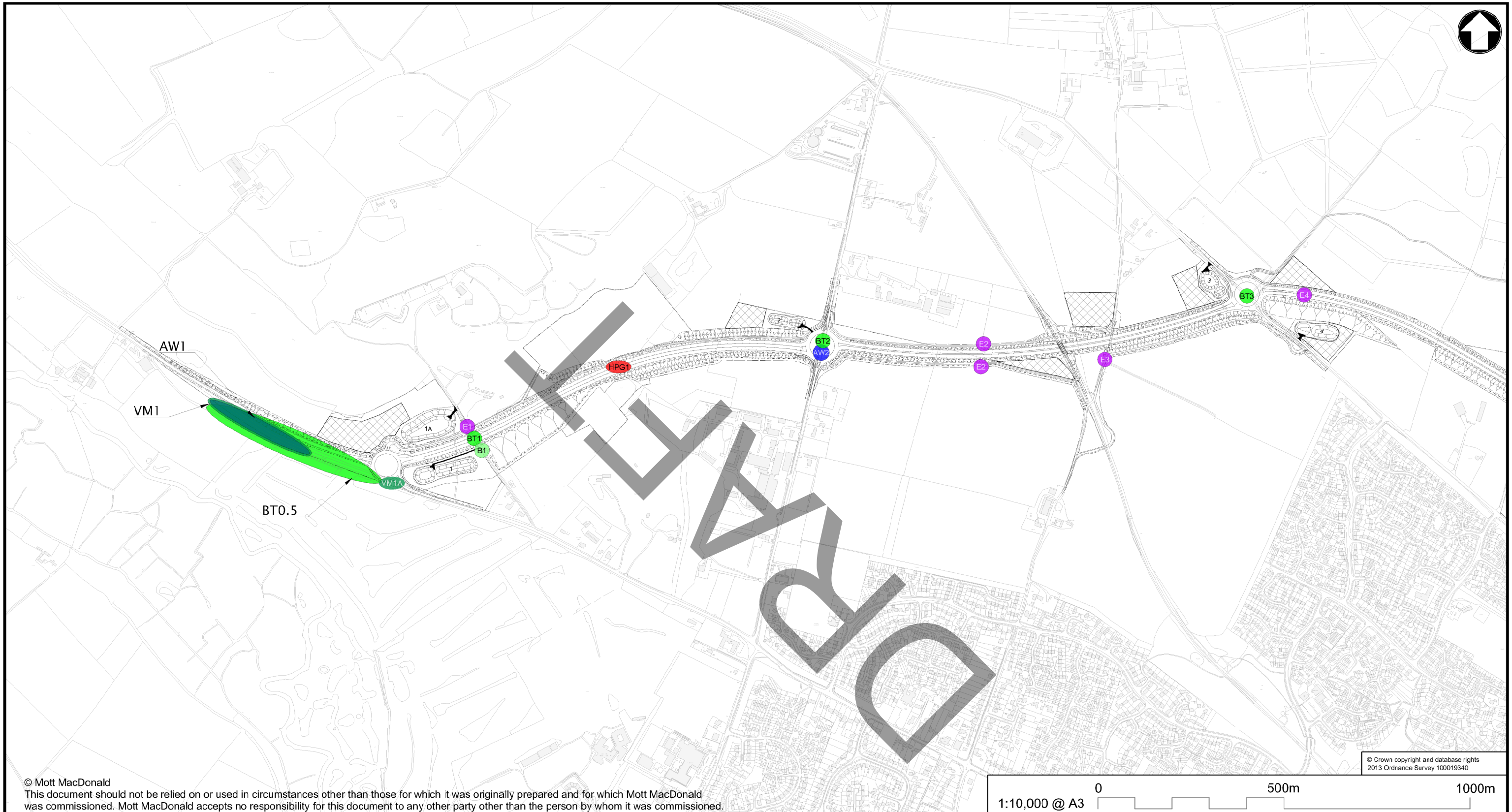
River Wensum - Unit 53

back View Map

Staff member responsible for SSSI unit:	Hannah Wallace
Unit ID:	1025558
Unit area:	18 hectares
Main habitat:	Rivers and streams
Condition:	Unfavourable no change
Latest assessment date:	16 March 2010
Reason for adverse condition:	Inappropriate water levels, inappropriate weirs dams and other structures, invasive freshwater species, siltation, water abstraction, water pollution - agriculture/run off, water pollution - discharge
Condition assessment comment:	Extent: no loss of river habitat. Hydrology, turbidity, siltation & phosphate targets are not being met for these to be regarded as favourable, but mechanisms are in place to address these issues. Water quality is favourable: EA biolological GQA data is good (A), chemical is good (A). The River Wensum Restoration Strategy has concluded that the channel in unit 53 consists of a significant length of free-flowing river between Lyng & Ringland, with sluggish over-widened, over-deepened and impounded river reaches upstream of Taverham Mill. The sampling point on Unit 53 exhibited the following characteristics: Slow, deep section through improved grassland on left hand bank & improved grassland/rank vegetation on the right. The left hand bank is extensively poached and grazed. Channel overwidened & deepened, with silt now building up along the edges starting to form berms. Some patches of gravel pebble substrate evident but it appears to be predominately silt, however extensive macrophyte growth makes this difficult to determine. Weedcutting was in progress at the time of the survey. Channel plants are dominated by Sparganium emersum & Potamogeton perfoliatus, with Butomus umbellatus, P. pectinatus and Sagittaria sagittifolia also

present. Small discrete patches of Ranunculus circinatus & R. penicillatus ssp. pseudofluitans present. Riparian zone unfavourable. The only bankside invasive plant of concern on Unit 53 is Himalayan balsam, which is prevalent on the bank downstream of Lyng. A scheme is planned, to be coordinated by the NNNSI. Azolla is occasionally noted on the river, but never achieves a cover that is problematic. Signal crayfish present downstream of Lenwade Mill, sufficient to conclude that the population of white-clawed crayfish is in unfavourable condition on this unit. Signal crayfish in the Wensum do not appear to harbour the crayfish plague, but simply out-compete the white-clawed crayfish.

Appendix F. Utilities plan



1:10,000 @ A3 — 0 — 500m — 1000m

AW1	Anglian Water - Potable	BT1	BT	E1	UK Power Networks	GPSS1	Misc. Utilities
AWS2	Anglian Water - Sewage	G1	National Grid	VM1	Virgin Media (formerly NTL)		

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Client

Norfolk County Council
County Hall
Martineau Lane
Norwich, NR1 2SG

Norfolk County Council

Rev	Date	Drawn	Description	Ch'k'd	App'd
0	10/13	AW	Revised for Submission	SA	JF

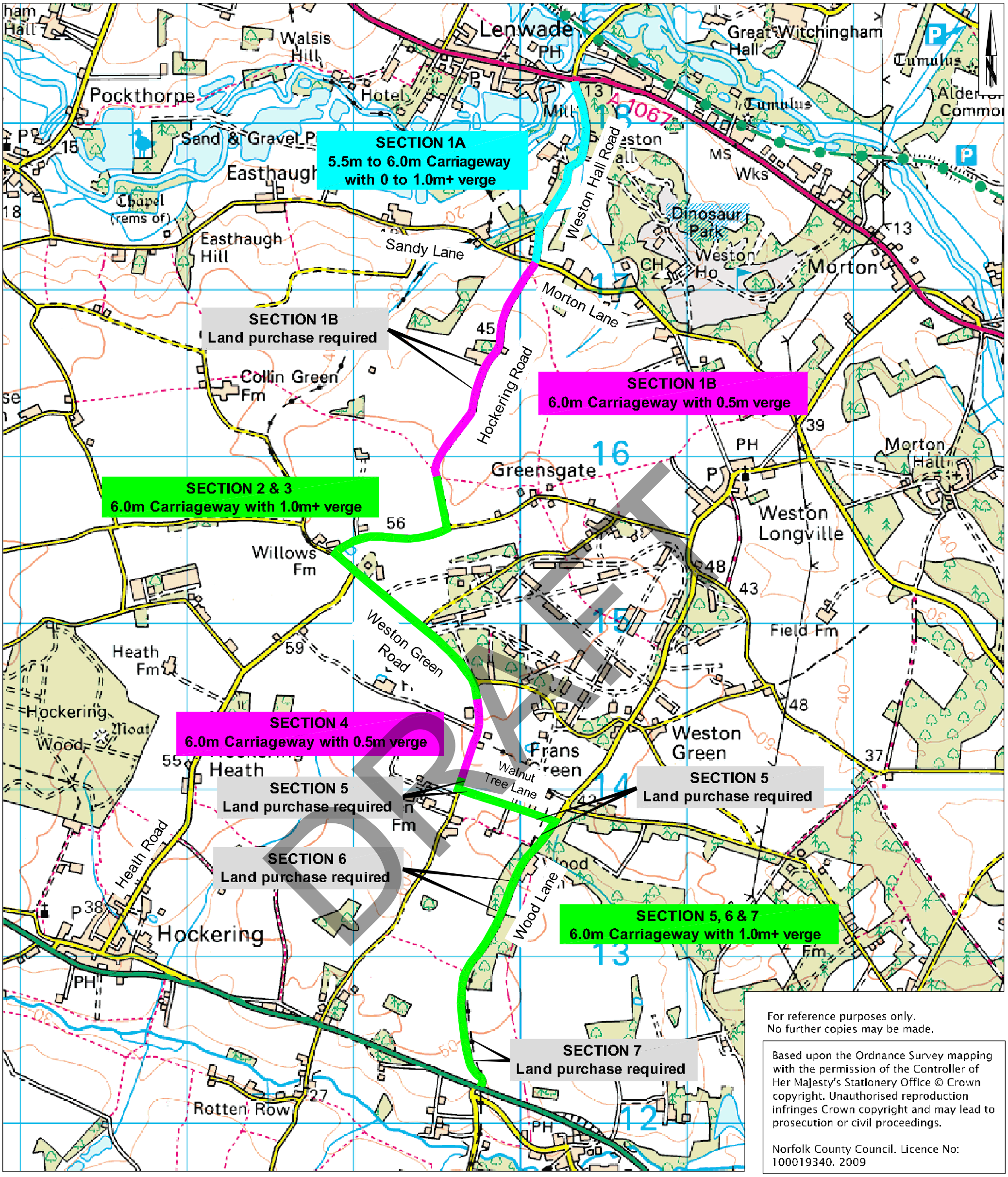
Title: Norwich Northern Distributor Road
Utility Works Locations

1 of 1

Drawn	AW
Checked	SA
Approved	JF
Scale at A3	1:10,000
Drawing Number	MMD-233906-DT-0723
Rev	0
Status	INF

P:\Norwich\MM Projects\233906 - NDR 2007\233906-DT-01 NDR ES 2012-13 - Drawings\00 - Working Drawings\08 - Nature Conservation\MMD-233906-DT-0723-0728-Rev0 Utility Works Locations.dwg Mar 26, 2014 - 10:49AM wor44127

Appendix G. Weston Hall Road



For reference purposes only.
No further copies may be made.

Norfolk County Council
working with
Mott MacDonald
MAY GURNEY

Mike Jackson
Director of Planning and Transportation
Norfolk County Council
County Hall
Martineau Lane
Norwich NR1 2SG

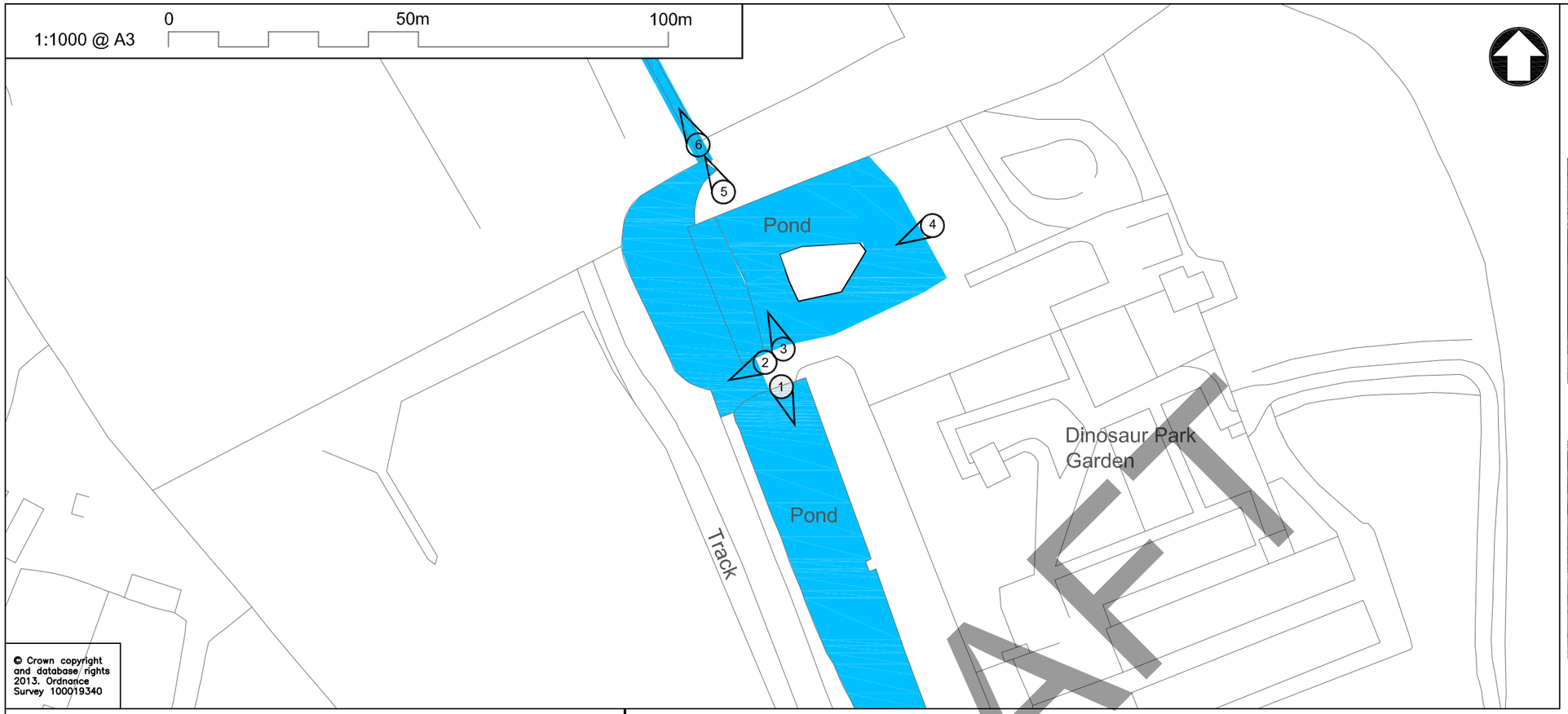
DRAWING TITLE
APPENDIX C:
COMBINED OPTION 1 + 3 ROUTE

Mott MacDonald
County Hall
Martineau Lane
Norwich, NR1 2US
Tel 01603 767530
Fax 01603 226760
Web www.mottmac.com

REV.	DESCRIPTION	CHECKED	DATE

	INIT.	DATE
DESIGNED BY	MEF	02/09
DRAWN BY	JT	02/09
CHECKED BY	MEF	02/09
APPROVED BY	SJB	02/09

DRAWING No.
233895-MN-038
PROJECT TITLE
Honingham to Lenwade
A47/A1067 Link Road Improvements
SCALE AT A3
NTS
FILE No.
233895-MN



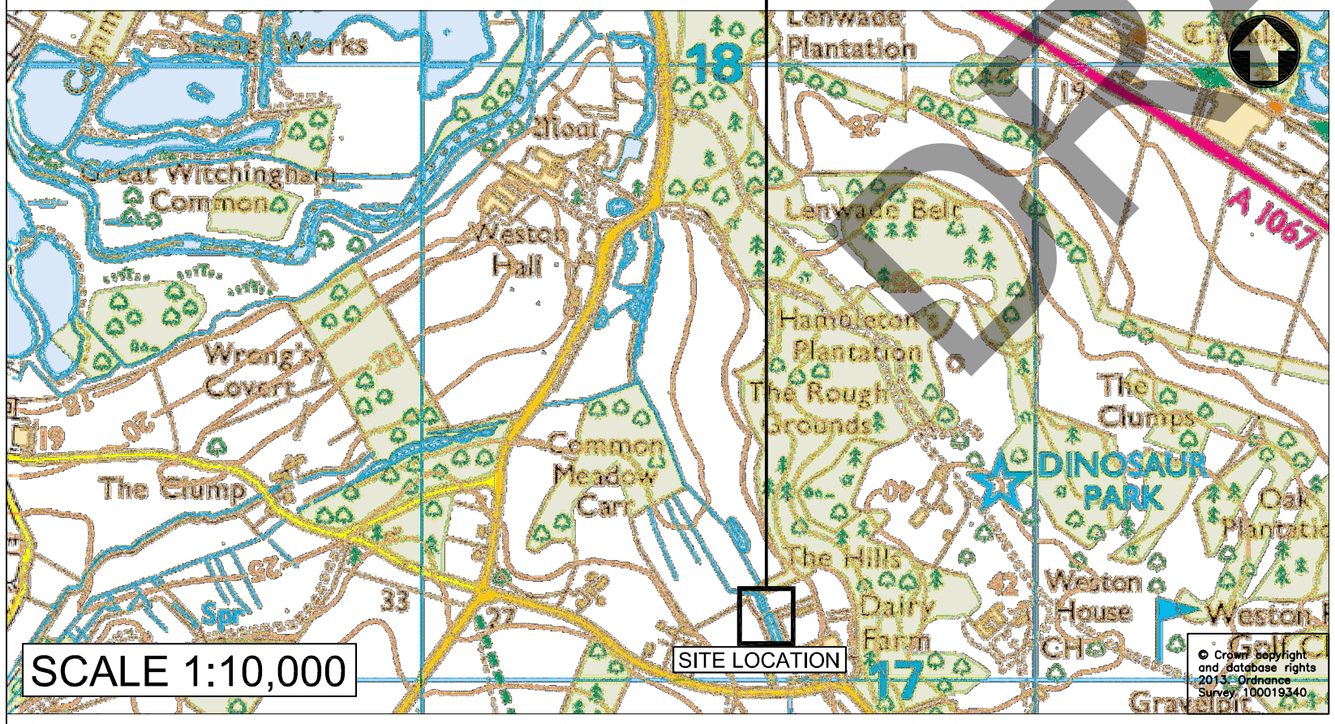


PHOTO 3.

PHOTO 4.

PHOTO 1.

PHOTO 5.

PHOTO 2.

PHOTO 6.

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Tom McCabe
Interim Director of Environment,
Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 1

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	O.S	04/14
DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

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FILE No. R1C093

PHOTO 7.

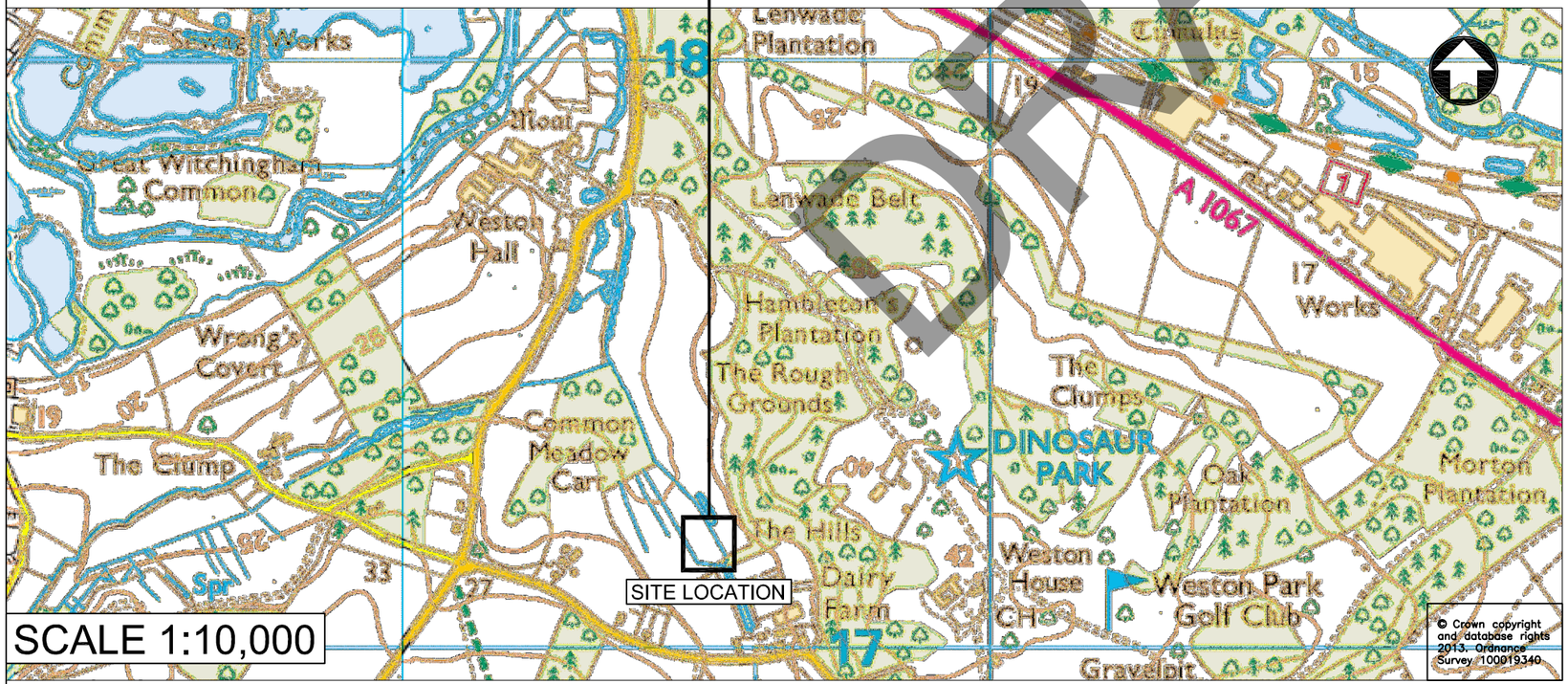

PHOTO 8.

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Interim Director of Environment,
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Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 2

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
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DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

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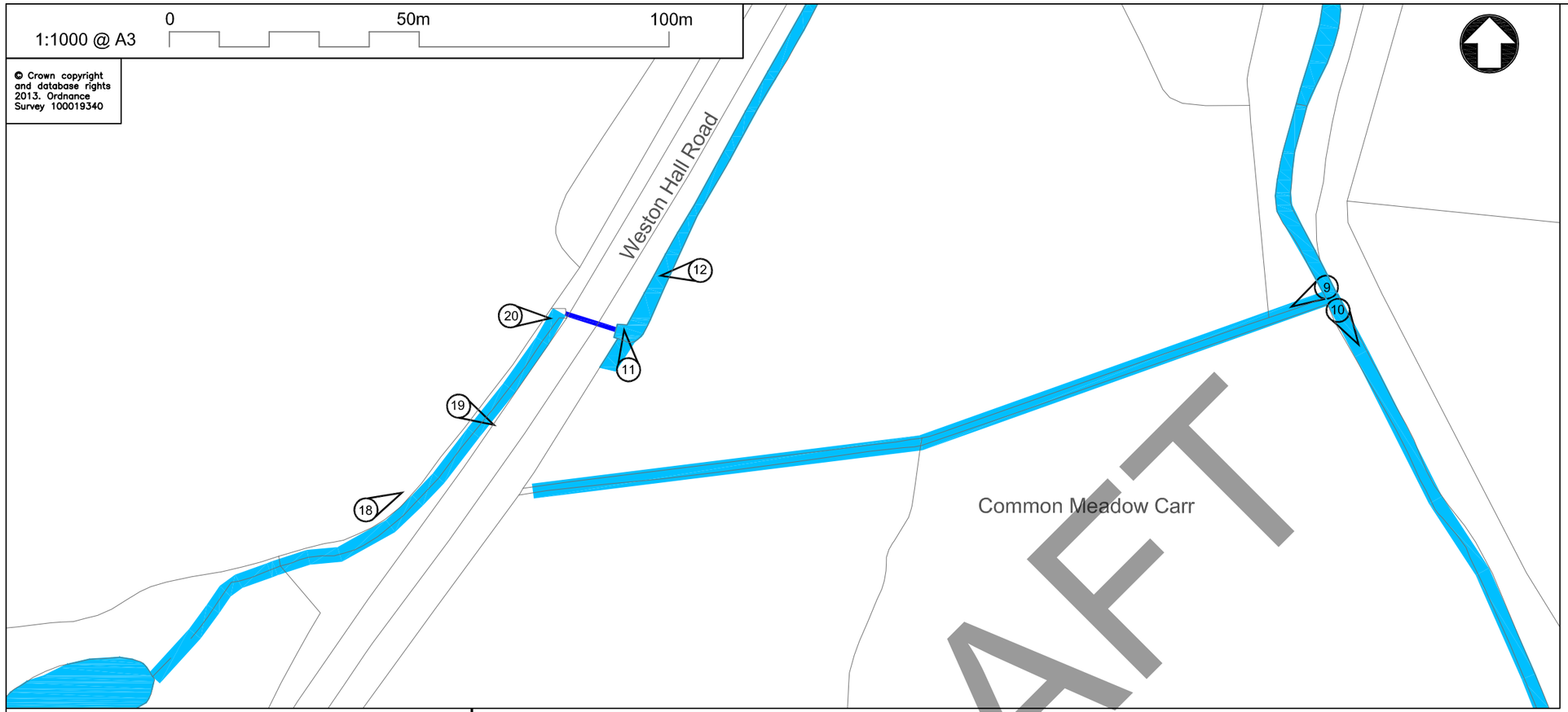
FILE No. R1C093



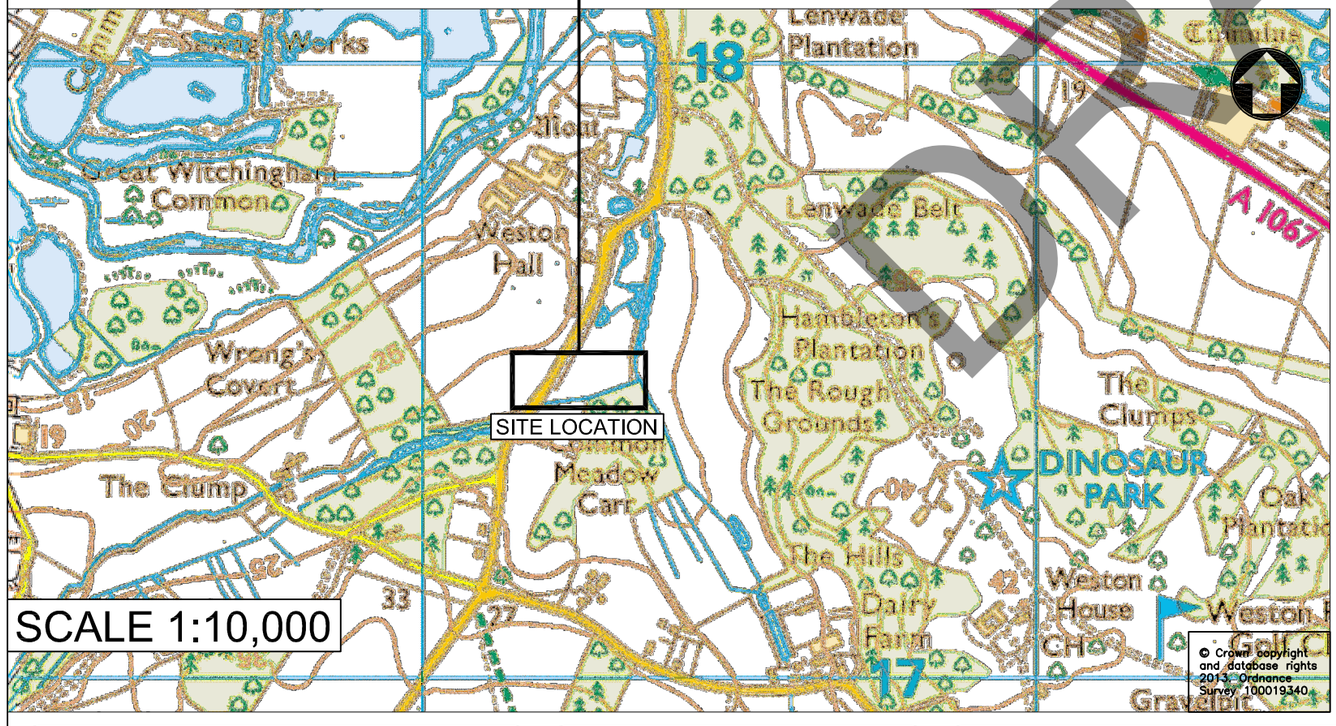


PHOTO 11.

PHOTO 12.

PHOTO 18.

PHOTO 9.

PHOTO 19.

PHOTO 10.

PHOTO 20.

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DRAWING TITLE

Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 3

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	O,S	04/14
DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

DRAWING No. R1C093-R1-4911
PROJECT TITLE: Norwich Northern Distributor Road
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FILE No. R1C093

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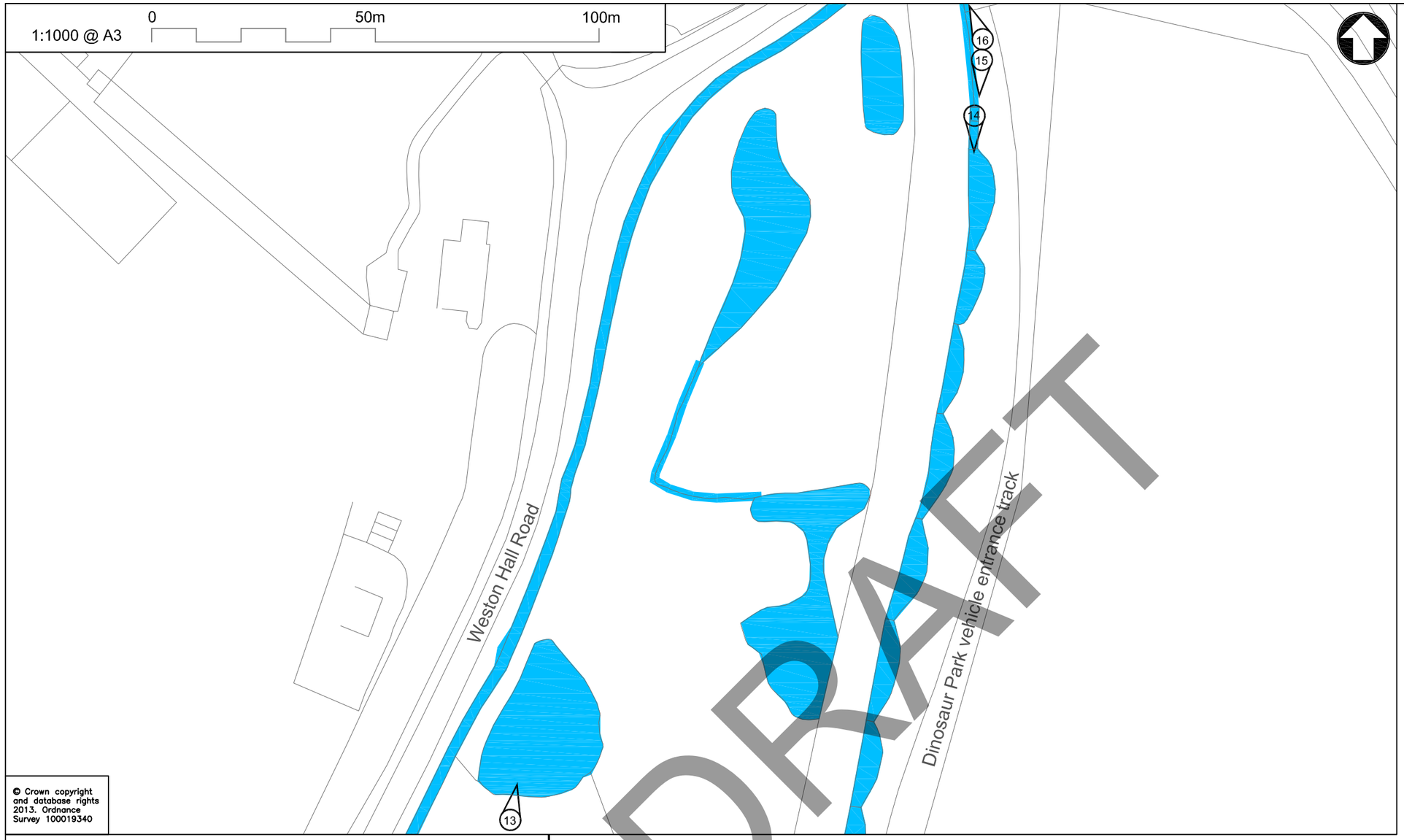

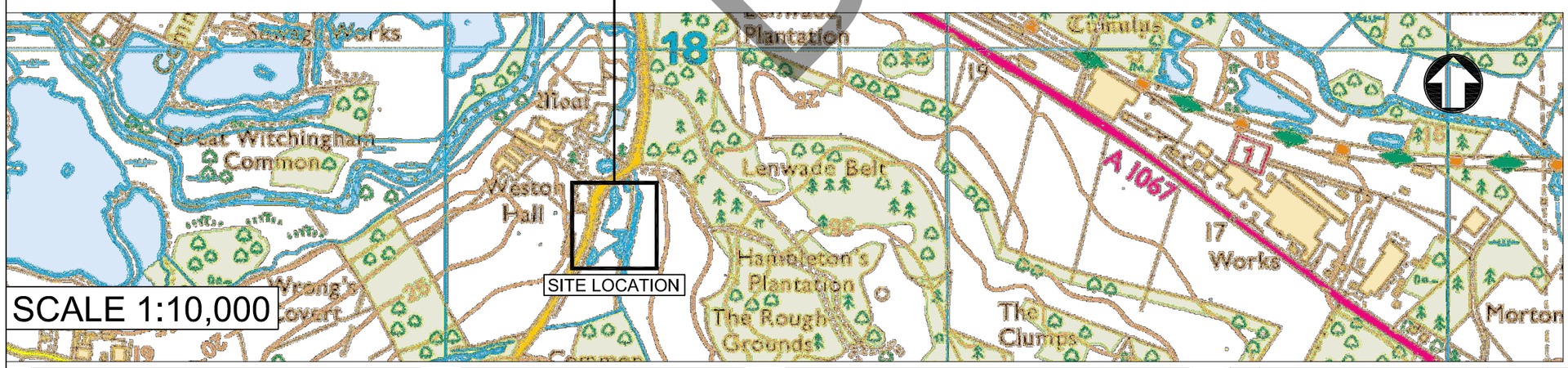

SCALE 1:10,000

PHOTO 13.

PHOTO 14.

PHOTO 15.

PHOTO 16.

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Interim Director of Environment, Transport and Development
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County Hall, Martineau Lane
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Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 4

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
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DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

DRAWING No. R1C093-R1-4912
PROJECT TITLE Norwich Northern Distributor Road
SCALE As Above
FILE No. R1C093


PHOTO 17.


PHOTO 24.


PHOTO 21.


PHOTO 25.


PHOTO 22.


PHOTO 26.


PHOTO 23.

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DRAWING TITLE
Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 5

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	O.S	04/14
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DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

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PHOTO 29.

PHOTO 30.

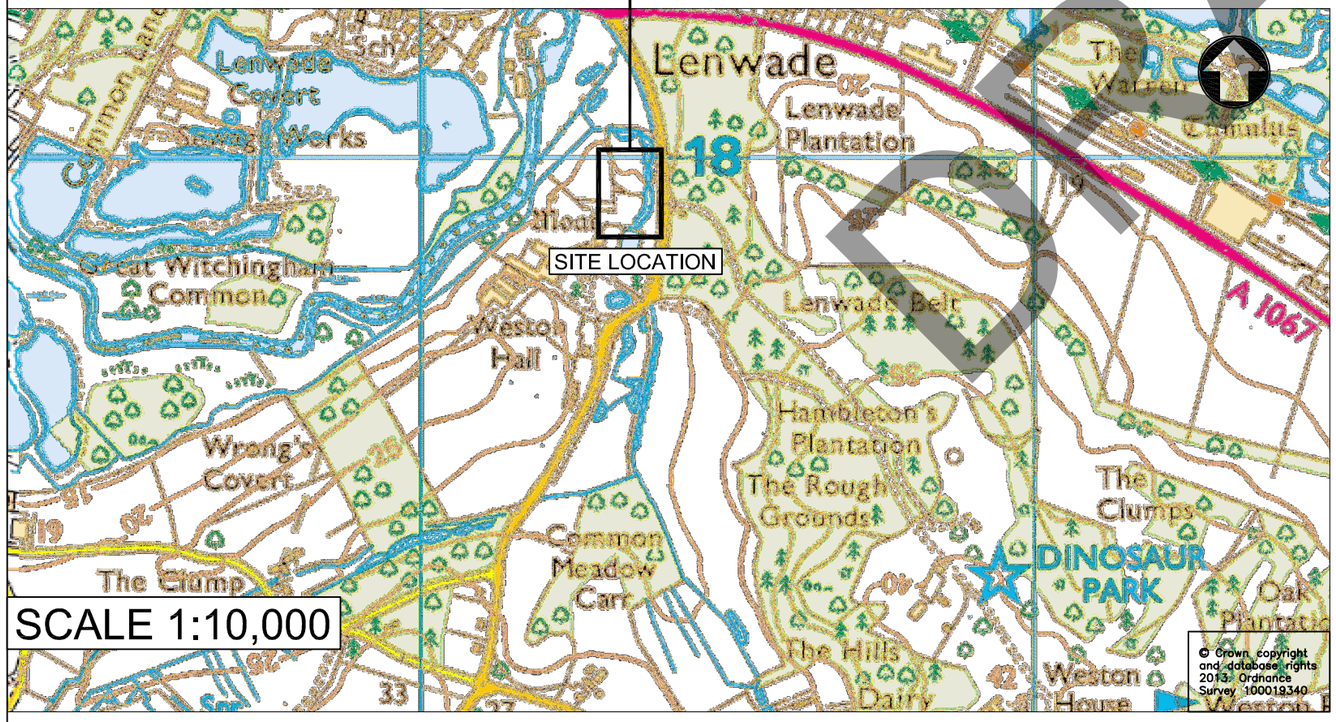

PHOTO 27.

PHOTO 31.

PHOTO 28.

PHOTO 32.

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Interim Director of Environment,
Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

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Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 6

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	O.S	04/14
DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

DRAWING No. R1C093-R1-4914
PROJECT TITLE Norwich Northern Distributor Road
SCALE As Above
FILE No. R1C093

PHOTO 36.

PHOTO 33.

PHOTO 37.

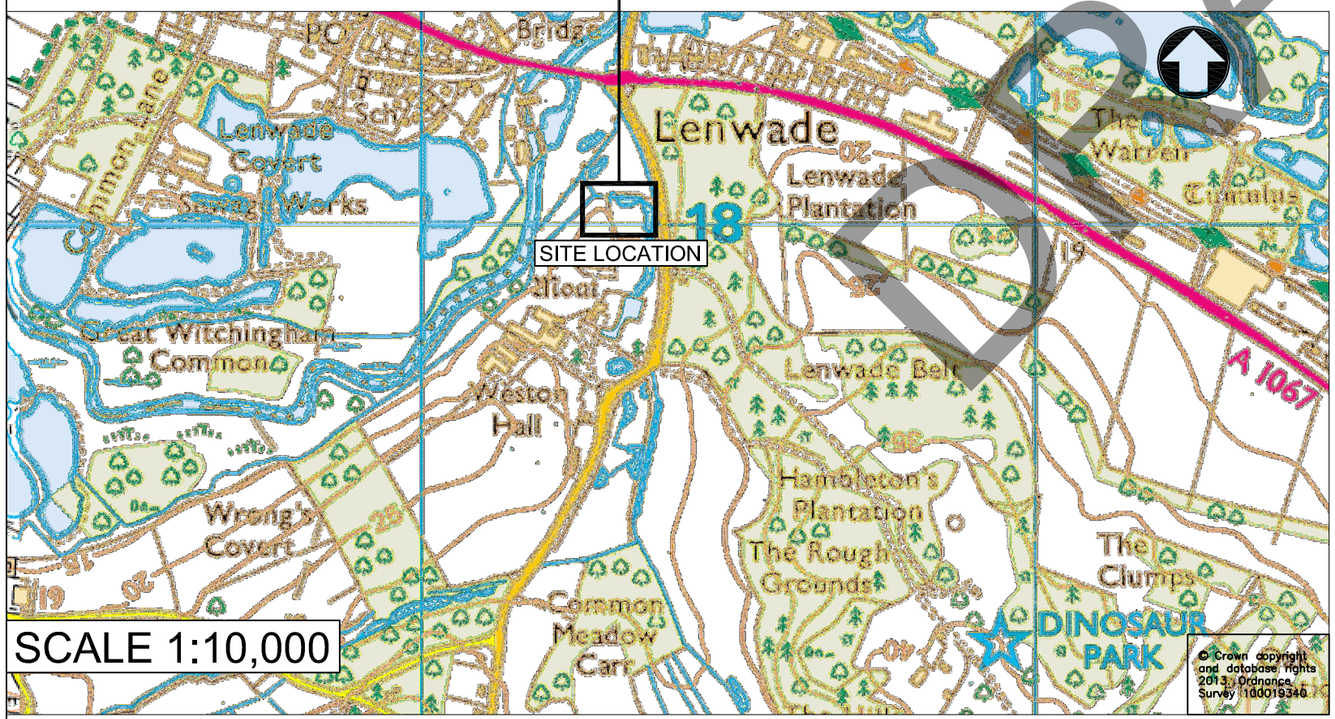

PHOTO 34.

PHOTO 38.

PHOTO 35.

PHOTO 39.

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Transport and Development
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Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 7

REV.	DESCRIPTION	CHECKED	DATE

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DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

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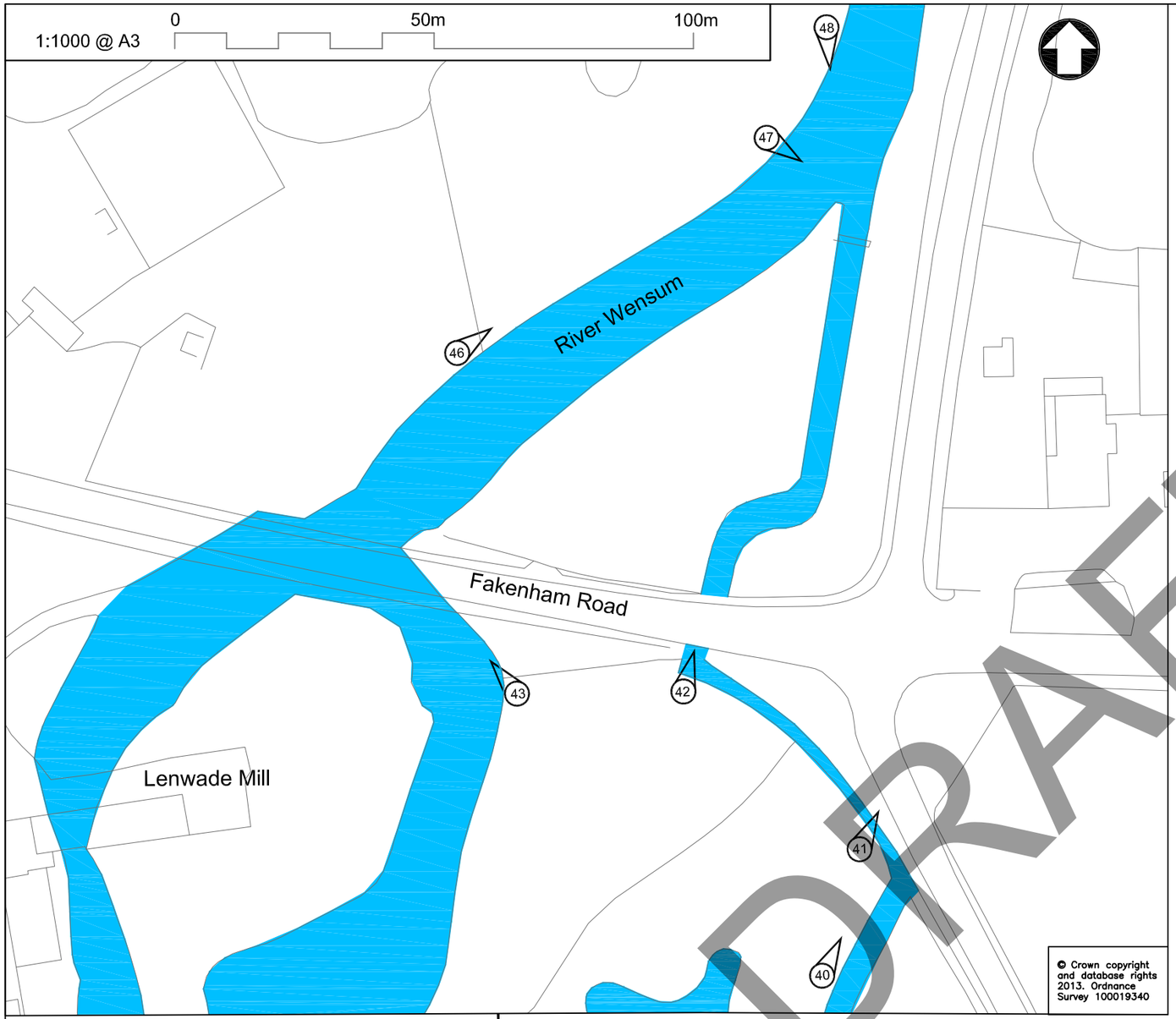
FILE No. R1C093



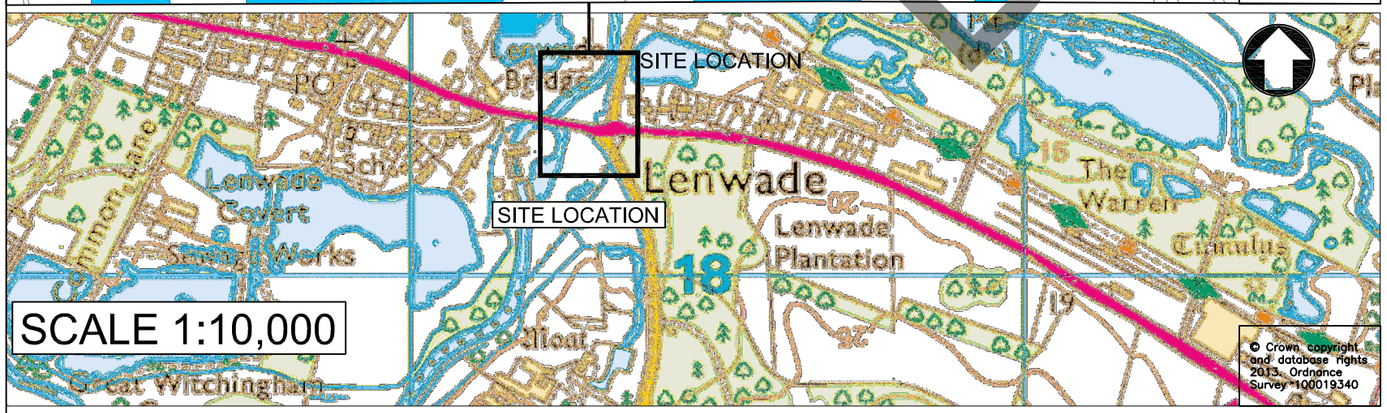



PHOTO 40.


PHOTO 46.


PHOTO 41.


PHOTO 47.


PHOTO 42.


PHOTO 48.


PHOTO 43.

Norfolk County Council
Mott MacDonald
Birse Civils

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 8

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	O.S	04/14
DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

DRAWING No. R1C093-R1-4916
PROJECT TITLE Norwich Northern Distributor Road
SCALE As Above
FILE No. R1C093

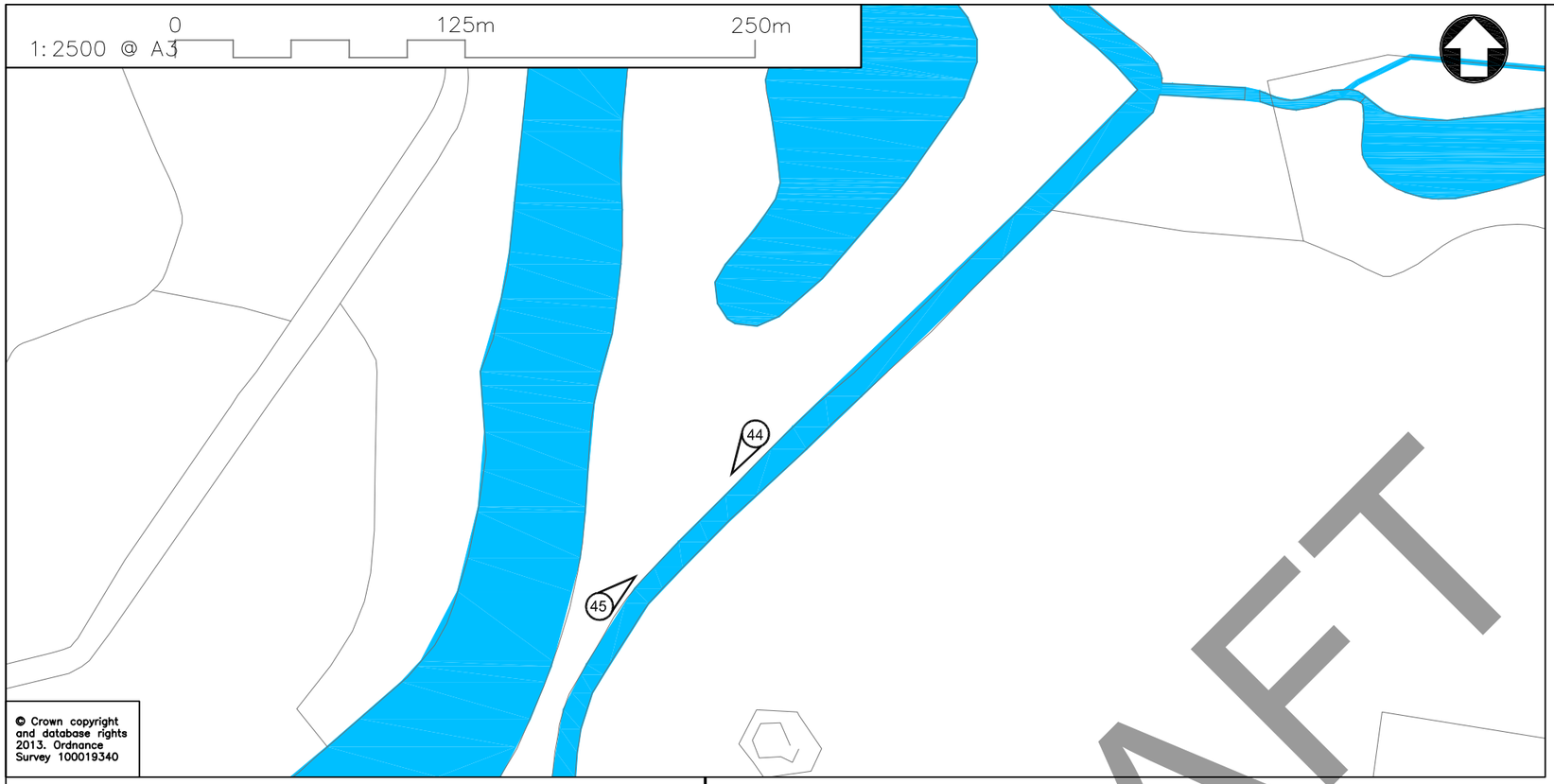


PHOTO 44.

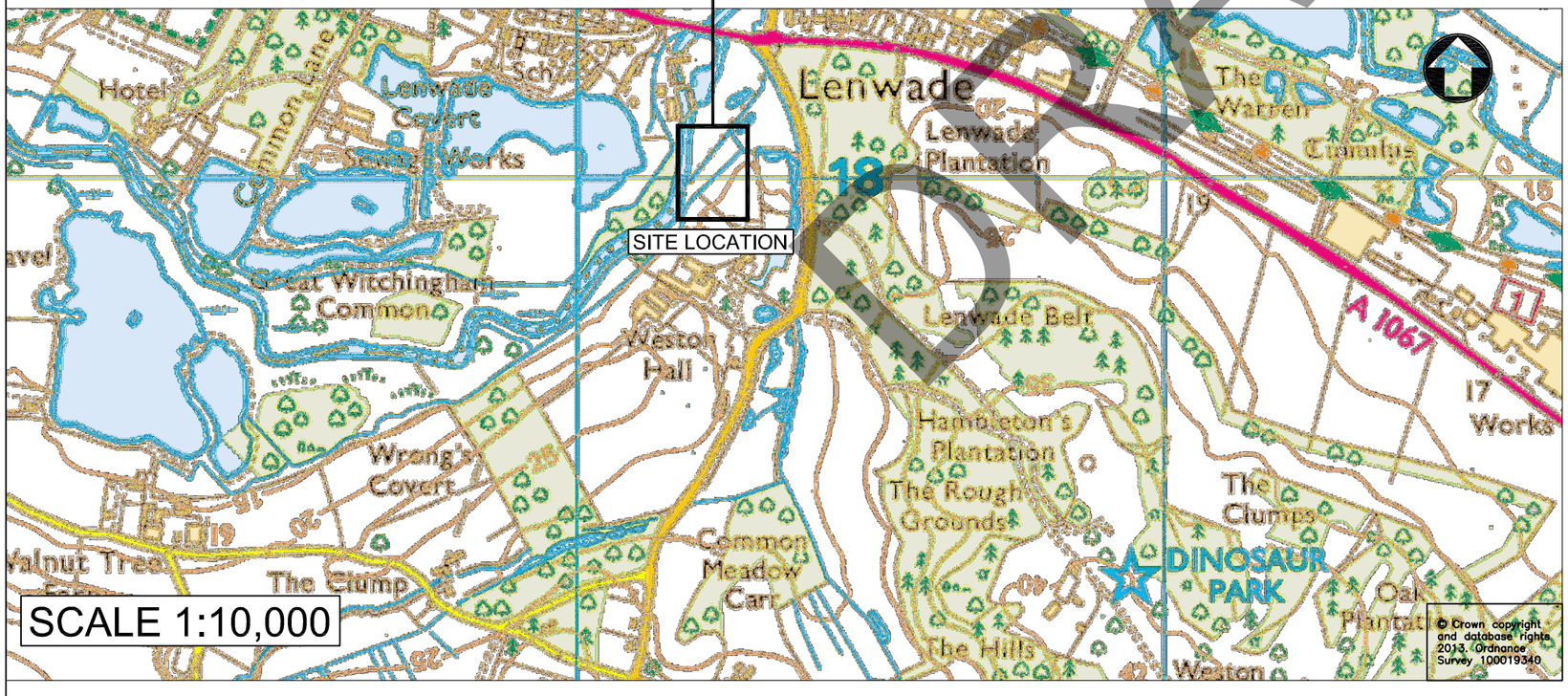


PHOTO 45.

Norfolk County Council
Mott MacDonald
Birse Civils

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

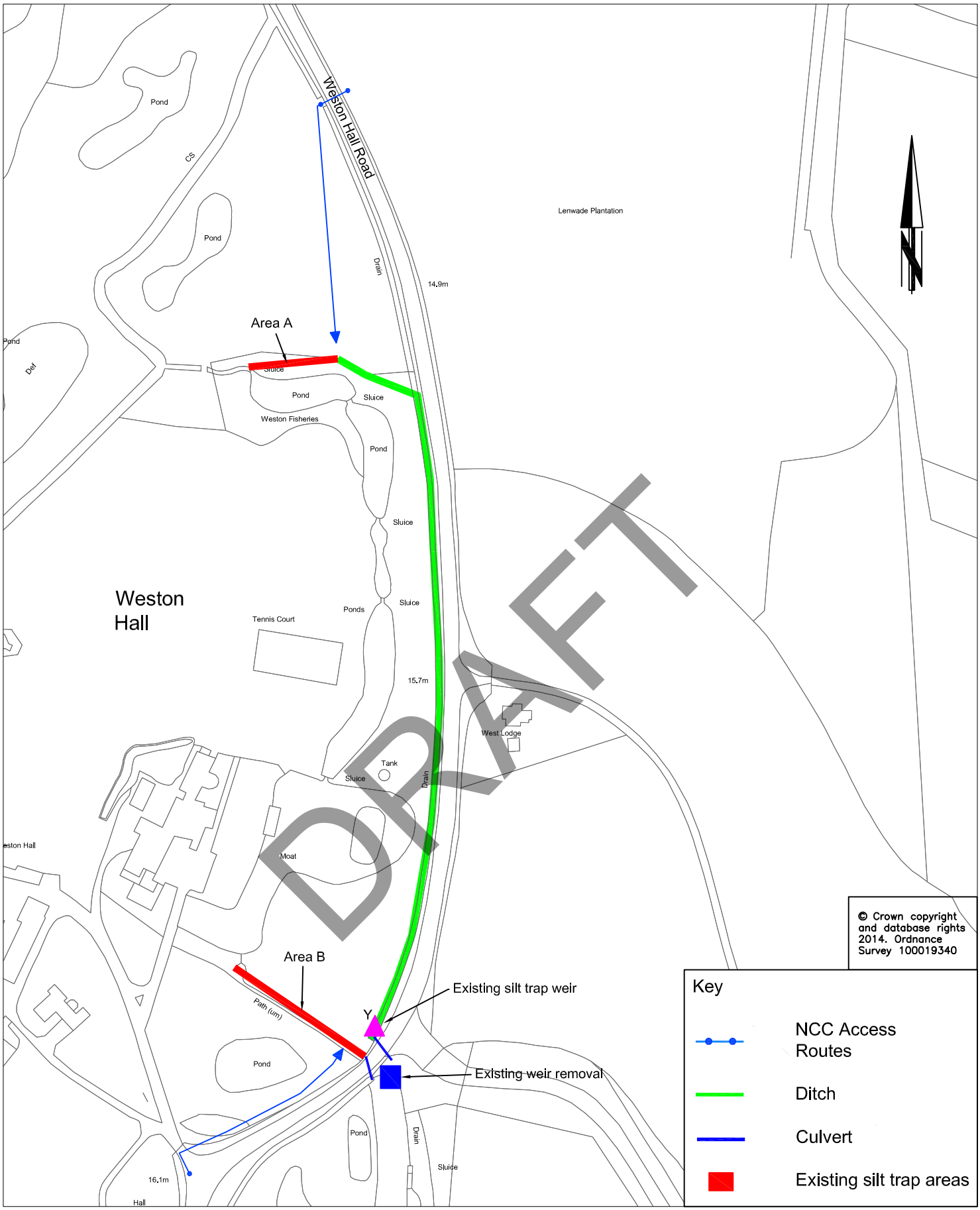
DRAWING TITLE

Norwich Northern Distributor Road
Weston Hall Estate & Dinosaur Park
Site Photos - Sheet 9

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	O.S	04/14
DESIGNED BY	JT	04/14
DRAWN BY	JT	04/14
CHECKED BY	MKu	04/14

DRAWING No. R1C093-R1-4917
PROJECT TITLE Norwich Northern Distributor Road
SCALE As Above
FILE No. R1C093



Norfolk

Mott MacDonald

Birse Civils

DRAWING TITLE

Norwich Northern Distributor Road
Weston Hall Estate Limited
Drainage Improvements

Tom McCabe
Interim Director of Environment,
Transport and Development
Norfolk County Council
County Hall
Martineau Lane
Norwich NR1 2SG

REV.	DESCRIPTION	CHECKED	DATE
	DRAFT		

	INIT.	DATE
SURVEYED BY	OS	2014
DESIGNED BY	JC	07/14
DRAWN BY	JC	07/14
CHECKED BY		

DRAWING No. R1C093-R1-4807

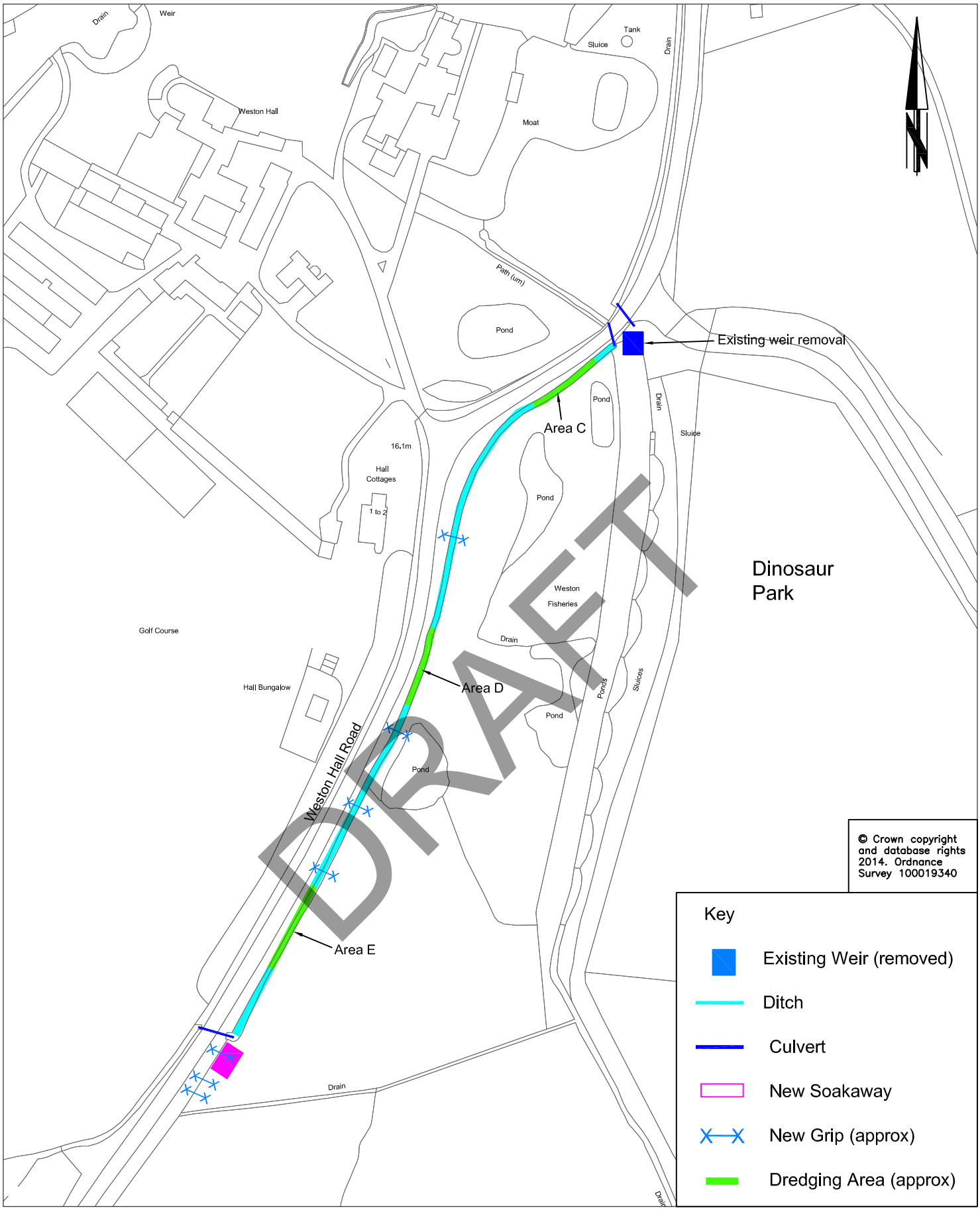
PROJECT TITLE Norwich Northern Distributor Road

SCALE 1:1500

FILE No. R1C093

ORIGINAL SIZE: A3

BIL 28/10/13



Norfolk
Mott MacDonald
Birse Civils

DRAWING TITLE

Norwich Northern Distributor Road
Norfolk Dinosaur Park Limited
Drainage Improvements

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall
Martineau Lane
Norwich NR1 2SG

REV.	DESCRIPTION	CHECKED	DATE
	DRAFT		

	INIT.	DATE
SURVEYED BY	OS	2014
DESIGNED BY	JC	07/14
DRAWN BY	JC	07/14
CHECKED BY		

DRAWING No. R1C093-R1-4808
PROJECT TITLE Norwich Northern Distributor Road
SCALE 1:1500
FILE No. R1C093

ORIGINAL SIZE: A3

BIL 28/10/13