NORTHAMPTON GATEWAY
STRATEGIC RAIL FREIGHT INTERCHANGE

APPLICANT'S RESPONSE TO SECRETARY OF STATE'S REQUEST FOR COMMENTS

The Northampton Gateway Rail Freight Interchange Order 201X

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THE NORTHAMPTON GATEWAY RAIL FREIGHT INTERCHANGE ORDER 201X

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1. INTRODUCTION

1.1 On 22 August 2019 the Secretary of State wrote to the Applicant in relation to some outstanding matters at the end of the Examination on which updated information was requested ("the Request").

1.2 The information requested was a response to the following two questions relating to the air quality assessment:

*"Please could the **Applicant** clarify how on-site construction plant and vehicle emissions have been assessed as well as off-site construction traffic to reach the conclusion at Appendix 9.11 that the construction of the Proposed Development is expected to have an overall Negligible impact."* (**Question 1**)

and

"Please could the Applicant indicate to the Secretary of State what Air Quality assessment has been done for construction of the Roade Bypass and A508 corridor, including Other Highway Mitigation Measures. The Secretary of State will require an assessment on the off-site construction traffic and on-site construction plant and vehicles emissions for all construction locations if not already undertaken." (**Question 2**)

1.3 This response is structured as follows:

- A reminder of the terminology in relation to the different parts of the order limits used throughout this report;
- Explanation of the approach to assessment of construction effects contained within the air quality chapter;
- Response to Question 1;
- Response to Question 2

1.4 All references to paragraph numbers of the Air Quality Chapter of the Environmental Statement ("ES") in this document are references to the latest version of that chapter submitted to the Examining Authority on 26 February 2019 (see Appendix 3 of the Applicant's Responses to ExQ2, **Document 8.17**, REP5-021).

2. TERMINOLOGY

2.1 This report identifies the different elements of the project as follows:

- Main Site (Works Numbers 1-6);
- Roade Bypass (Works No. 13);
- Junction 15 (Works No. 8);
- A45 N of J15 Wootton (Works No. 10)
- Junction 15a (Works No. 11);
- Other highway mitigation works (A508 route upgrade sites) (Works No.s 7, 9, 12, 14, 15, 16 ,17).

2.2 Where the expression "on-site" is used in the Request it has been taken to mean on land within the Order limits upon which the works listed above are being carried out and that has been applied in this report.

2.3 The on-site emission sources comprise:

- Dust emissions from construction, earthworks and demolition activities;
- Construction plant known as Non Road Mobile Machinery (NRMM[1]);
- Heavy Duty Vehicles (HDVs) active on the site; and
- Delivery vehicles (HDVs and light duty vehicles).

2.4 The off-site emission sources comprise:

- All local on-road traffic;
- Off-site construction traffic; and
- Any other local sources of emissions (i.e. included in background).

3. EXPLANATION OF APPROACH TO ASSESSMENT CARRIED OUT IN THE AIR QUALITY CHAPTER (AS REVISED)

3.1 The following assessments were carried out and reported on in the Air Quality Chapter:

a) Construction Traffic

3.2 The construction traffic assessment results were provided in Appendix 9.11. The construction traffic assessment included local traffic emissions as well as

[1] Non Road Mobile Machinery (NRMM) definition https://www.vehicle-certification-agency.gov.uk/other/non-road-mobile-mach.asp

off-site traffic emissions associated with construction. Traffic flows used in the Construction Traffic Assessment were included in the original ES (Transport Assessment Appendix 33).

3.3 The study area for off-site construction traffic impacts was identified using the EPUK & IAQM guidance, which states that impacts on air quality can be deemed to be insignificant where a development will cause a change in average annual daily traffic/flows (AADT/AADF) of less than 500 Light Duty Vehicles (100 within an AQMA) and/or 100 Heavy Duty Vehicles (25 within an AQMA).

3.4 These criteria were only exceeded on the M1 North (through Collingtree AQMA) and the A45 (through Wootton AQMA).

3.5 It should be noted that the above criteria are more conservative than the equivalent criteria taken from the Design Manual for Roads and Bridges (DMRB) air quality assessment approach, which are frequently used in assessments of this type, such as Highways England road assessments. The DMRB states that changes in AADT of less than 1,000 LDV or 200 HDV can be considered insignificant. Under these criteria, the potential for significant construction traffic impacts could have been screened out of the assessment at all locations.

3.6 The conclusion reached in the ES is that emissions from construction traffic would not result in a significant impact on air quality at local sensitive receptors. This is because of

- the relatively small numbers of vehicle movements that would be generated by construction traffic;
- the routeing strategy which confines construction traffic to the strategic highway (ES Para 12.7.17);
- construction traffic from the Main Site not being allowed to use the A508 south; and
- the measures and processes provided for in the CEMP.

b) Construction Dust

3.7 The Construction Phase Dust assessment methodology (9.3.5) was set-out in the Air Quality chapter (9.3.5) and followed joint guidance provided by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM), as well as Greater London guidance. Local Air Quality Management Technical Guidance (LAQM.TG(16)) was also referred to. The construction phase dust assessment included assessing the impacts from Demolition, Earthworks, Construction and Track-out. The assessments included the following:

- Northampton Gateway Main Site, M1 & A45 highway improvements were assessed in 9.5.3 to 9.5.21;

- Roade Bypass & A508 Improvements were assessed in 9.5.22 to 9.5.35;
- Other Highways Mitigation Measures were assessed in 9.5.36 to 9.5.37;
- Intra-development cumulative dust emissions was also assessed in 9.5.38; and
- Cumulative effects of proposed Rail Central scheme in 9.8.1 to 9.8.2.

3.8 The conclusions of the dust assessment was that overall the potential for impacts from dust with proposed mitigation measures in place, is negligible as stated in ES 9.7.1 and cumulatively with other projects in ES 9.8.2.

c) On-site vehicle and plant emissions

3.9 On-site vehicle and plant emissions were referred to in section 9.5.39 of the ES. They were assessed by the application of a qualitative assessment, in line with the Defra LAQM.TG(16) guidance, from which it was concluded that there would be no likely significant effects. This conclusion in part informed the conclusion in Appendix 9.11 regarding construction effects on air quality overall. However, it is acknowledged that the assessment, the conclusion reached, and the application of the guidance, was not explained anywhere within the Air Quality chapter.

3.10 The relevant LAQM.TG(16) guidance is referred to in Appendix B of this response. The qualitative assessment of on-site construction plant and vehicles emissions was undertaken for the proposed development taking into account all on-site emissions following the LAQM.TG(16) (7.26) approach. Having had regard to LAQM.TG(16) the impacts of on-site construction plant (Non Road Mobile Machinery (NRMM)) and on-site vehicle emissions were excluded from further consideration within the assessment for the following reasons:

- The demolition of buildings is minimal and at a significant distance from sensitive receptors;
- The construction of the development is separated into phases and any impacts will be of a temporary nature;
- The bulk of the construction works and haul routes (if any) are set well away from any sensitive receptors;
- any emissions associated with the overall construction phase will be of a smaller magnitude than the operational phase (which will have no significant impact on air quality); and
- The Construction Environment Management Plan (CEMP) and each Phase CEMP (P-CEMP) includes provision for:
    - The siting of certain activities away from sensitive receptors;
    - The choice of plant and equipment (e.g. those with tighter emission standards or diesel particulate filters) which will minimise impacts;

- Each P-CEMP will include a 'dust management plan' which will set out the methods to be used to control dust and other emissions to air'

3.11 Having regard to the above factors in the context of the guidance in LAQM.TG(16), including the role of the CEMP and other "suitable controls and site management" in managing and controlling emissions to air, it was concluded that there would be no likely significant effects on air quality as a result of on-site NRMM and on-site vehicle emissions.

4. RESPONSE TO QUESTION 1

4.1 As explained in paragraphs 3.1 – 3.11 above , the conclusions in Appendix 9.11 were informed by a quantitative assessment of off-site construction traffic and a qualitative assessment of on-site plant and on-site vehicle emissions. However, as acknowledged in paragraph 3.9 above, the qualitative assessment was not explained in the Air Quality chapter.

4.2 To assist, and notwithstanding the qualitative assessment explained in paragraph 3.10 above, the Applicant has now undertaken further assessments relating to on-site plant and on-site vehicle emissions comprising:

- a quantitative assessment of the effects on the Main Site, the Road Bypass and Junction 15; and
- a qualitative assessment of the effects of the remainder of the highway works (in part informed by the qualitative assessment referred to in the bullet point above).

4.3 The assessment for the remainder of the highway works is a qualitative one rather than quantitative, because:

- these Works sites are significantly smaller in size;
- the number of NRMM and on-site vehicles are very small;
- the periods of on-site activity are in most cases very short ;
- receptors were at a significant distance from Works sites; and
- significantly, the air quality in the area of the Works sites is well below the relevant Air Quality Standards.

4.4 In our experience these criteria fulfil the LAQM.TG(16) (7.26) requirements for a qualitative assessment to be appropriate rather than a quantitative assessment.

4.5 The assessments are set out below.

Quantitative On-Site Air Quality Assessments

4.6 Quantitative on-site air quality assessments have been undertaken for the following locations:

- Main Site,
- Roade bypass, and
- Junction 15.

4.7 The quantitative assessment of air quality from the construction site emissions has been undertaken to assess:

- Non-road mobile machinery (NRMM) deployed across the sites during earthworks, major excavations and construction; and
- Mobile vehicle activity within the site areas (i.e. HGV movements and delivery vehicles on site corridors and haul routes).

4.8 The quantitative assessment methodology, and inputs for NRMM and vehicles modelling assessment, are provided in Appendix A of this response.

4.9 The aim of this quantitative modelling assessment is to provide an indication of which, if any, human receptors are adversely affected by the stages of the development in combination with external (off-site) activities, i.e. road traffic in the vicinity of the development. The detailed list of receptor locations is provided in Appendix A and Appendix C Figures 1, 2 and 3.

Air Quality modelling

4.10 The ADMS 5 (Ver 5.2.2.0) air dispersion model has been used to undertake the assessment of the NRMM emissions in conjunction with ADMS-Roads (Ver 4.1.1) which was used to model emissions from on-site vehicle activity.

4.11 These dispersion models have been used extensively throughout the UK for assessing the air quality impacts arising from on-site construction activities.

4.12 Model input data and sources of information used in the quantitative assessment are also provided in Appendix A. These include emissions calculations and factors, background concentration data, NO_X:NO_2 conversion factors, meteorological data and other model input parameters.

4.13 Model receptors identified in Tables 1 and 2 below are a combination of receptor locations identified in the ES (see ES paragraph 9.3.24 and Table 9.1 which refers to receptors C1 to C17, NSSUE1 to NSSUE3 and W1 to W5) as well as new receptors identified specifically for this additional quantitative assessment (receptors CP1 to CP5, RCP1 to RCP8).

Modelled Receptors

4.14 Details of all the modelled receptors are included in Table A.4 of Appendix A.

4.15 Modelled receptors included all the receptors modelled in Appendix 9.11 of the ES where the impact of off-site construction traffic was assessed. This was done to allow an assessment of the combined impact of both on and off-site construction impacts.

4.16 Furthermore, the additional receptors to the Main Site (CP1 – CP5) and Roade Bypass (RCP1 – RCP8) were also modelled. This was done to assess whether on-site emissions, in isolation, have the potential to significantly worsen air quality.

Quantitative Assessment Results

4.17 Results for the quantitative modelling assessments for each of the Main Site Roade bypass and Junction 15 are provided in Table 1 and Table 2.

4.18 The results presented in Tables 1 and 2 identify the contribution of emissions from on-site Works activities (in isolation (column B)) at each receptor from all the assessed Works sites (Main Site, Roade bypass and Junction 15). Table 1 and 2 also present the combined impact of on-site and off-site construction activities at all receptor locations included in Appendix 9.11 of the ES (column C).

Table 1: Predicted NO_2 annual mean contribution from on-site (only) and combined (on-site and off-site) construction activities at sensitive receptors.

Name	Without	With Construction (on-site only)	With Construction (on and off-site	With (B) - Without	% Change of AQS	Significance	With (C) - Without	Combined % Change of AQS	Combined Significance
	A	B	C	B-A	B-A	B-A	C-A	C-A	C-A
Collingtree receptors									
C1	34.8	35.0	35.1	0.2	0.5%	Negligible	0.3	0.7%	Negligible
C2	33.5	33.7	33.7	0.2	0.4%	Negligible	0.2	0.6%	Negligible
C3	32.1	32.3	32.3	0.2	0.4%	Negligible	0.2	0.6%	Negligible
C4	30.8	30.9	31.0	0.1	0.4%	Negligible	0.2	0.6%	Negligible
C5	25.0	25.2	25.2	0.1	0.3%	Negligible	0.2	0.4%	Negligible
C6	27.8	27.9	28.0	0.1	0.3%	Negligible	0.2	0.5%	Negligible
C7	26.3	26.4	26.5	0.1	0.3%	Negligible	0.2	0.5%	Negligible
C8	28.7	28.8	28.9	0.1	0.3%	Negligible	0.2	0.4%	Negligible
C9	28.7	28.8	28.9	0.1	0.3%	Negligible	0.2	0.5%	Negligible
C10	28.7	28.8	28.9	0.1	0.3%	Negligible	0.2	0.5%	Negligible
C11	28.6	28.7	28.8	0.1	0.3%	Negligible	0.2	0.5%	Negligible
C12	28.6	28.7	28.8	0.1	0.3%	Negligible	0.2	0.5%	Negligible
C13	30.3	30.4	30.5	0.1	0.2%	Negligible	0.2	0.4%	Negligible
C14	30.3	30.4	30.5	0.1	0.2%	Negligible	0.2	0.5%	Negligible
C15	30.1	30.2	30.3	0.1	0.2%	Negligible	0.2	0.4%	Negligible
C16	34.3	34.4	34.5	0.1	0.2%	Negligible	0.2	0.4%	Negligible
C17	30.0	30.0	30.1	0.1	0.2%	Negligible	0.1	0.3%	Negligible
NSSUE1	23.2	23.3	23.3	0.0	0.1%	Negligible	0.1	0.3%	Negligible

Name	Without	With Construction (on-site only)	With Construction (on and off-site	With (B) - Without	% Change of AQS	Significance	With (C) - Without	Combined % Change of AQS	Combined Significance
	A	B	C	B-A	B-A	B-A	C-A	C-A	C-A
NSSUE2	25.4	25.5	25.5	0.1	0.1%	Negligible	0.1	0.3%	Negligible
NSSUE3	24.7	24.7	24.8	0.1	0.1%	Negligible	0.1	0.3%	Negligible
Wootton receptors									
W1	17.9	17.9	18.0	0.0	0.1%	Negligible	0.1	0.3%	Negligible
W2	23.4	23.4	23.6	0.0	0.1%	Negligible	0.2	0.4%	Negligible
W3	20.0	20.0	20.1	0.0	0.1%	Negligible	0.1	0.2%	Negligible
W4	23.9	23.9	24.0	0.0	0.0%	Negligible	0.1	0.3%	Negligible
W5	20.8	20.9	20.9	0.0	0.0%	Negligible	0.1	0.2%	Negligible
Main Site receptors									
CP1	14.6	14.7	-	0.1	0.1%	Negligible	-	-	-
CP2	10.3	10.3	-	0.0	0.0%	Negligible	-	-	-
CP3	9.4	9.4	-	0.0	0.1%	Negligible	-	-	-
CP4	14.6	14.7	-	0.0	0.1%	Negligible	-	-	-
CP5	8.7	8.8	-	0.0	0.1%	Negligible	-	-	-
Roade Bypass receptors									
RCP1	8.1	8.4	-	0.3	0.8%	Negligible	-	-	-
RCP2	8.1	8.3	-	0.2	0.4%	Negligible	-	-	-
RCP3	9.2	9.2	-	0.1	0.2%	Negligible	-	-	-
RCP4	9.1	9.4	-	0.3	0.8%	Negligible	-	-	-
RCP5	9.1	9.3	-	0.3	0.6%	Negligible	-	-	-
RCP6	9.1	9.3	-	0.2	0.5%	Negligible	-	-	-
RCP7	8.1	8.2	-	0.1	0.2%	Negligible	-	-	-

Name	Without	With Construction (on-site only)	With Construction (on and off-site	With (B) - Without	% Change of AQS	Significance	With (C) - Without	Combined % Change of AQS	Combined Significance
	A	B	C	B-A	B-A	B-A	C-A	C-A	C-A
RCP8	8.5	8.6	-	0.0	0.1%	Negligible	-	-	-

Note: Air Quality Standard (AQS) annual mean for NO_2 = 40µg.m^{-3}
EU Limit Value (LV) for NO_2 = 40µg.m^{-3}

New receptors (CP1 – CP5 and RCP1 – RCP8) were added to those previously assessed in the ES and Appendix 9.11. These new receptors were not assessed against the off-site construction traffic as both the new Main Site receptors (CP1 – CP5 (Ref: Appendix C Figure 1)) and new Roade Bypass receptors (RCP1 – RCP8 (Ref: Appendix C Figure 2)) are a significant distance from the off-site construction routes.

Table 2: Predicted PM_{10} annual mean contribution from on-site (only) and combined (on-site and off-site) construction activities at sensitive receptors.

Name	Without	With Construction (on-site only)	With Construction (on and off-site	With (B) - Without	% Change of AQS	Significance	With (C)-Without	Combined % Change of AQS	Combined Significance
	A	B	C	B-A	B-A	B-A	C-A	C-A	C-A
Collingtree receptors									
C1	19.8	19.8	19.8	0.0	0.0%	Negligible	0.0	0.1%	Negligible
C2	19.6	19.6	19.6	0.0	0.0%	Negligible	0.0	0.1%	Negligible
C3	19.3	19.3	19.3	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C4	19.1	19.1	19.1	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C5	18.1	18.1	18.1	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C6	18.5	18.5	18.6	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C7	18.3	18.3	18.3	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C8	18.7	18.7	18.7	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C9	18.7	18.7	18.7	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C10	18.7	18.7	18.7	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C11	18.7	18.7	18.7	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C12	18.7	18.7	18.7	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C13	19.0	19.0	19.0	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C14	19.0	19.0	19.0	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C15	18.9	19.0	19.0	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C16	19.7	19.7	19.7	0.0	0.0%	Negligible	0.0	0.0%	Negligible
C17	18.9	18.9	18.9	0.0	0.0%	Negligible	0.0	0.0%	Negligible
NSSUE1	17.7	17.8	17.8	0.0	0.0%	Negligible	0.0	0.0%	Negligible

Name	Without	With Construction (on-site only)	With Construction (on and off-site	With (B) - Without	% Change of AQS	Significance	With (C)- Without	Combined % Change of AQS	Combined Significance
	A	B	C	B-A	B-A	B-A	C-A	C-A	C-A
NSSUE2	18.1	18.1	18.1	0.0	0.0%	Negligible	0.0	0.0%	Negligible
NSSUE3	18.0	18.0	18.0	0.0	0.0%	Negligible	0.0	0.0%	Negligible
Main Site receptors									
W1	17.6	17.6	17.6	0.0	0.0%	Negligible	0.0	0.0%	Negligible
W2	18.9	18.9	18.9	0.0	0.0%	Negligible	0.0	0.1%	Negligible
W3	18.1	18.1	18.1	0.0	0.0%	Negligible	0.0	0.1%	Negligible
W4	19.0	19.0	19.1	0.0	0.0%	Negligible	0.0	0.1%	Negligible
W5	18.3	18.3	18.3	0.0	0.0%	Negligible	0.0	0.1%	Negligible
Main Site receptors									
CP1	16.0	16.0	-	0.0	0.0%	Negligible	-	-	-
CP2	14.5	14.5	-	0.0	0.0%	Negligible	-	-	-
CP3	14.4	14.4	-	0.0	0.0%	Negligible	-	-	-
CP4	16.0	16.0	-	0.0	0.0%	Negligible	-	-	-
CP5	13.8	13.8	-	0.0	0.0%	Negligible	-	-	-
Roade Bypass receptors									
RCP1	13.7	13.7		0. 0	0.0%	Negligible			
RCP2	13.7	13.7	-	0.0	0.0%	Negligible	-	-	-
RCP3	14.5	14.5	-	0.0	0.0%	Negligible	-	-	-
RCP4	14.2	14.3	-	0.0	0.0%	Negligible	-	-	-
RCP5	14.2	14.3	-	0.0	0.0%	Negligible	-	-	-
RCP6	14.2	14.3	-	0.0	0.0%	Negligible	-	-	-
RCP7	13.7	13.7	-	0.0	0.0%	Negligible	-	-	-

Name	Without	With Construction (on-site only)	With Construction (on and off-site	With (B) - Without	% Change of AQS	Significance	With (C)- Without	Combined % Change of AQS	Combined Significance
	A	B	C	B-A	B-A	B-A	C-A	C-A	C-A
RCP8	14.2	14.2	-	0.0	0.0%	Negligible	-	-	-

Note: Air Quality Standard (AQS) annual mean for PM_{10} = 40µg.m^{-3}
EU Limit Value (LV) for PM_{10} = 40µg.m^{-3}

New receptors (CP1 – CP5 and RCP1 – RCP8) were added to those previously assessed in the ES and Appendix 9.11. These new receptors were not assessed against the off-site construction traffic as both the new Main Site receptors (CP1 – CP5 (Ref: Appendix C Figure 1)) and new Roade Bypass receptors (RCP1 – RCP8 (Ref: Appendix C Figure 2)) are a significant distance from the off-site construction routes.

NO_2 Results

4.19 The data in Table 1 show that all increases in NO_2 concentrations as a result of on-site (only) emissions are predicted to be negligible, with reference to the IAQM impact descriptors set out in Appendix A of this document.

4.20 The data in Table 1 show that all increases in NO_2 concentrations as a result of the combined impact of on-site emissions and off-site construction traffic are predicted to be negligible, with reference to the IAQM impact descriptors set out in Appendix A of this document.

4.21 As such, these increases are not of sufficient magnitude to influence the overall judgement of significance set out in Appendix 9.11.

PM_{10} Results

4.22 The data in Table 2 show that all increases in PM_{10} concentrations as a result of on-site (only) emissions are predicted to be negligible, with reference to the IAQM impact descriptors set out in Appendix A of this document.

4.23 The data in Table 2 show that all increases in PM_{10} concentrations as a result of the combined impact of on-site emissions and off-site construction traffic are predicted to be negligible, with reference to the IAQM impact descriptors set out in Appendix A of this document.

4.24 As such, these increases are not of sufficient magnitude as to influence the overall judgement of significance set out in Appendix 9.11.

Discussion

4.25 The data in Table 1 and 2 provide an upper estimate of the impact of on-site emissions on local pollution concentrations.

4.26 It is our professional judgement that on-site emissions will have a far smaller contribution to local pollution concentrations as all modelled inputs have tended towards worst case assumptions. These worst-case assumptions are explained in further detail in Appendix A but include the assumptions that:

- All NRMM will comply with Stage IIIB emission standards (from 2011) when the actual fleet will include newer NRMM with far tighter emission standards (e.g. Stage IV (2014) and Stage V(2019);
- That 18 months of construction (and associated emissions) for the Roade Bypass are compressed into 12 months; and
- That NRMM exhaust temperatures will be less than 100°C when most, if not all, NRMM exhaust gases will be far hotter (Hotter exhaust gases disperse more effectively).

Qualitative On-Site Air Quality Assessments

4.27 Qualitative on-site air quality assessments have been undertaken at the following sites:

- J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9)
- J15 M1 - A45 N of Wootton (Works No. 10)
- Junction 15a (Works No. 11)
- A508 route upgrade – work sites:
    - A508 adjacent to site entrance (Works No. 7)
    - Courteenhall Road (Blisworth) junction improvement (Works No.12);
    - Rookery Lane / Ashton Road junction improvement (Works No. 14);
    - Pury Road junction improvement (Works No. 15)
    - Knock Lane / Stoke Road junction improvement (Works No. 16); and
    - A508 at Grafton Regis /Church Lane junction improvement (Grafton Regis) (Works No. 17).

Qualitative Assessment Methodology

4.6 The methodology for assessing the on-site impacts follow LAQM.TG(16) guidance as described in Appendix B.

4.7 The location of receptors in close proximity to the Works sites are identified in Appendix C Figures 4 to 15.

Qualitative Assessment Results

4.8 Results for the qualitative assessments for each of the A508 route upgrade construction sites are provided in Table 3.

Table 3: Summary of qualitative assessments for Works Sites.

Criteria from LAQM.TG (16) (See Appendix B)	**1 Works duration (weeks)**	**2 Number of NRMM**	**3 Operational time (% of hours/year)**	**4 Emission standards of NRMM (min.)**	**5 Number of receptors within 20m/ 50m**	**6 Background pollutant concentrations Annual mean (µg.m^{-3})**		**Significant Effects**	**Criteria for identifying no likely significant effects in LAQM.TG(16)**
Works Site						**NO_2**	**PM_{10}**		
J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9) *excludes Collingtree Footbridge Works	52	25	43%	Stage III B	0 / 0	16.7	16.7	**No**	5, 6
J15 M1 - A45 N of Wootton (Works No. 10)	10	3	8%	Stage III B	1 / 5	14.5	16.7	**No**	2, 3, 5, 6
Junction 15a (Works No. 11)	24	14	20%	Stage III B	0 / 0	17.6	16.4	**No**	5, 6
A508 access (Works No. 7)	48	17	40%	Stage III B	0 / 0	14.8	16.7	**No**	5, 6
Courteenhall Road (Works No. 12)	8	3	6%	Stage III B	1 / 2	9.5	14.9	**No**	2, 3, 5, 6

Criteria from LAQM.TG (16) (See Appendix B)	**1 Works duration (weeks)**	**2 Number of NRMM**	**3 Operational time (% of hours/year)**	**4 Emission standards of NRMM (min.)**	**5 Number of receptors within 20m/ 50m**	**6 Background pollutant concentrations Annual mean (µg.m^{-3})**		**Significant Effects**	**Criteria for identifying no likely significant effects in LAQM.TG(16)**
Works Site						**NO_2**	**PM_{10}**		
Rookery Lane / Ashton Rd (Works No. 14)	26	13	21%	Stage III B	1 / 2	8.5	14.8	**No**	3, 5, 6
Pury Road (Works No. 15)	6	3	5%	Stage III B	1 / 2	7.9	13.8	**No**	2, 3, 5, 6
Knock Lane / Stoke Road (Works No. 16)	8	3	6%	Stage III B	2 / 2	8.3	14.1	**No**	2, 3, 5, 6
A508 at Grafton Regis / Church Lane (Works No. 17)	6	3	5%	Stage III B	10 / 10	8.3	15.0	**No**	2, 3, 6

Results

4.9 Table 3 identifies that all Works site areas have been assessed and are considered not to result in any likely significant effects following the LAQM .TG(16) guidance.

4.10 Works sites 10, 12, 15 and 16 all had exceptionally low operational hours during the year.

4.11 Work Sites 9 (excluding Collingtree Footbridge Works), 11 and 7 had no receptors within close proximity of the sites and Work Sites, 12, 14,15 and 16 had only 1-2 receptors in close proximity. *The combined impact of construction emissions (both on-site and off-site traffic) from Roade Bypass, the Main Site and Junction 15 improvements have been quantitatively assessed. Emissions from these large sources were demonstrated to have no significant impact on air quality in Table 1 and Table 2. Therefore, there is no likely significant effect from the minor works proposed at Works Sites 9 (Collingtree Footbridge).

4.12 All Works sites were identified to have very low background concentrations and are well below the AQS.

4.13 Overall all Works Sites are likely to have no significant effect on local receptors.

4.14 Considering the results from the Main site, Roade Bypass and the Junction 15 construction assessment were all negligible, and that these sites are significantly smaller and of a temporary nature, this evidence supports the qualitative assessment that these sites will also likely be negligible.

4.15 In conclusion there are no likely significant environmental effects from emissions from the on site plant and construction traffic on the assessed Work sites, there will be no significant impact on local air quality and the overall construction impact of the works will remain negligible.

Summary of results

4.16 The data in Table 1 and Table 2 support the assertion that on-site construction exhaust emissions from NRMM and vehicles will have no likely significant impact on local air quality.

4.17 The qualitative assessment of impacts from on-site activities presented in Table 3 also demonstrates that there will be no likely significant impact on local air quality.

4.18 Overall there will be no significant impact on local air quality and the overall impact of all the works will remain negligible.

RESPONSE TO QUESTION 2

4.19 Paragraphs 3.1 – 3.11 above explain the assessment that was undertaken for the Roade Bypass, J15, J15A and A508 corridor including the other highway mitigation measures.

4.20 As described in paragraphs 4.1 to 4.18 above additional assessment has been carried out of the on-site construction plant and on-site vehicle emissions for all construction locations.

Appendix A

Quantitative Assessment - Methodology

A quantitative assessment of emissions from on-site non-road mobile machinery (NRMM) and on-site vehicles across the Main Site, Roade Bypass and Junction 15 has been undertaken in response to the Secretary of State's question. This sits alongside the qualitative assessment already undertaken, as described in the main body of the response.

The aim of this further assessment is to demonstrate the predicted contribution that on-site NRMM and other on-site vehicles might have on pollution concentrations at local sensitive receptors.

Where sensitive human receptors are in close proximity to roads where construction vehicles will route and are also close to the boundaries of the Main Site, Roade Bypass and Junction 15 Work Sites, the assessment has looked at the combined impact of both construction traffic and emissions from these Work Sites.

NRMM and on-site traffic data

The first stage of the quantitative assessment is to identify the number and type of plant that will be working on the Work Sites.

This information was collated by the noise consultants for the project, Vanguardia, in relation an assessment of construction phase noise (Appendix 8.2 Summary of Assumptions Construction Noise Predictions of Noise ES).

This information has been adapted for air quality purposes with further clarity provided on the power ratings (kW) of each piece of NRMM and the likely percentage of 'on-time' (including throughout the year). A summary of this information is provided in Annex 1. Within Annex 1, the number and type of NRMM are also categorised into types of work activity.

Information regarding the NRMM to be used within Works Area 8 (i.e. Junction 15 improvements) were provided by the proposed contractors for the project.

The number of construction vehicles working within the boundaries of the Main Site Roade Bypass and Junction 15 are sourced from **Appendix 33 of the Transport Assessment (ES Appendix 12.1);** however, a summary of the number and type of vehicles working on these sites in Year 4 is shown in Annex 1. Please note that these figures have been converted to AADT (Annual Average Daily Trips) and are not one-way trips as shown in Appendix 33 of the above Transport Assessment.

The second and third stages are to identify where each work activity will take place and for how long. Areas of differing construction activities were defined using information within the following drawings:

- Parameters Plan;

- Works Plans Main Site Composite;
- Works Plans Key Plan; and
- Main Site Phasing Plan.

The information regarding the phasing of construction activities was provided in the revised infrastructure summary programme (see Appendix 01 of the CEMP).

Emissions year

A worst case year was selected to identify the highest emission year for the assessment, following the CEMP, Appendix 01 – Indicative Master Programme. Year 4 was selected as it possessed the most on-site activities, these include: J15 Improvements, Bulk earthworks (phase 2), Landscaping (phase 1), Rail terminal construction (terminal, reception, sidings and signalling), Buildings (Zone A1a and Zone A4). Year 5 was the worst-case year for the construction of the Roade Bypass.

The parameters plan, in conjunction with the revised infrastructure programme, was used to identify that Zones A1a and A4 would be constructed in Year 4. See Figure 17 of Appendix C for the location of construction activities in Year 4.

The Main Site Phasing Plan was used to identify the area in which Bulk Earthworks and landscaping would occur in Year 4. See Figure 17 of Appendix C of this response for the location of Bulk Earthworks in Year 4.

The Works and Main Site Composite Plan which breaks up the Main-Site by Works Numbers (Nos) was used to identify where rail infrastructure would be located (Works Nos 1-3). See Figure 18 of Appendix C of this response for the location of rail infrastructure construction in Year 4.

The Works Plans Key Plan was used to identify the area where Junction 15 improvements will occur. See Figure 18 of Appendix C of this response for the location of Junction 15 improvement works.

The Haul routes have been assumed to run adjacent to and parallel to the proposed works activity areas. The haul routes are shown in Figure 18 of Appendix C of this document.

There are multiple figures showing the location of Work Activity Areas in Year 4 (Figures 16 – 18). This is because some of the Work Activity Areas in Year 4 overlap (i.e. they occupy the same space) and so a single figure could not show the full extent of each Work Activity Area

There is no detailed phasing information for Roade Bypass yet and as such, to ensure a robust, worst-case assessment, it has been assumed that 18 months' worth of construction activity occurs in 12 months. Despite Year 5 being the likely worst-case year for Roade Bypass emissions, it has been assumed that all activities occur in Year 4. This is highly-conservative as it assumes that all on-site Roade Bypass emissions occur in the same year that the greatest emissions from the Main Site are expected.

Figures showing the location and type of activity have been included in Appendix C, for reference.

Air Quality models

The ADMS 5 (Ver 5.2.2.0) model (produced by Cambridge Environmental Research Consultants (CERC)) is used to predict emissions from NRMM. This is a dispersion model which has been used extensively throughout the UK for assessing the air quality impacts arising from developments of this nature and which is accepted as an appropriate air quality modelling tool by regulators and planning authorities.

ADMS-Roads (Ver 4.1.1) is used to model emissions from vehicles travelling on haul routes within the boundaries of the Main Site. AMDS-Roads was also used in the main body of the assessment to assess the impacts of off-site traffic generated during the operational and construction phases of the proposed development.

Emission Factors *On site delivery vehicles and HGVs.*

Within the original assessment, Defra's Emission Factor Toolkit (EFT)(version 8.0.01) was used to provide emission factors and background concentrations which were used to predict the impact of the development on local air quality. This toolkit was released in 2017 and was based on monitoring data from 2015.

Since the ES Chapter was submitted to the SoS, Defra has released a new version of the EFT (Version 9.0). This toolkit was released in May 2019 and is based on monitoring data from 2017.

To ensure that the results from this assessment are directly comparable to the results in the main body of the assessment, the same assumptions have been used, as well as considering the latest available from Defra both EFTs have been used in the assessment. With the 'most conservative' results

Emission factors for all on-site traffic were taken from 2021, which will be 'Year 4' should determination for Northampton Gateway occur this year. If determination is delayed, the vehicle fleet will continue to improve and the use of '2021' emission factors will be worst-case.

NRMM emissions calculations

Emission limits for NRMM depend on the age of the equipment, with regulations specifying tighter standards as new plant items enter into service. Stage IIIB standards, as specified in the NRMM (Emission of Gaseous and Particulate Pollutants) Regulations 1999, as amended, were enacted for new plant in the UK between January 2011 and January 2013, depending upon engine power rating, and the Stage IV standards were enacted in January and October 2014 for new plant. These standards provide limits on emissions of nitrogen oxides (NO_X) and particulate matter (PM).

It is not yet clear what the age structure of the construction plant complement will be at the time construction activities take place; as such a worst case/conservative approach was adopted, assuming that all plant will be Stage IIIB which takes into account the higher emitting plant as opposed to cleaner Stage IV standard plant. The Stage IIIB

emission standards for NRMM are included below with reference to the grams of NOx and PM per kilowatt hour (g/kWh):

Table A.1: Stage III B Emissions Standards (NO_x and PM)

Cat	Net Power	Date	NO_x (g/kWh)	PM (g/kWh)
L	130 <=P <= 560	2011.01	2.0	0.025
M	75 <=P < 130	2012.01	3.3	0.025
N	56 <=P < 75	2012.01	3.3	0.025
P	37<=P < 560	2013.01	4.7*	0.025

Note: NOx and HC . It has been assumed that all PM emits in the PM10 fraction (i.e. 0% PM2.5)

The data shows that plant with larger Net Power have tighter emission standards.

Stage IV emission plant standards are also shown below for reference. This has not been modelled but has been included to highlight that the newer pieces of plant have far more stringent emissions standards.

Table A.2: Stage IV Emissions Standards (NO_x and PM)

Cat	Net Power	Date	NO_x (g/kWh)	PM (g/kWh)
Q	130 <=P <= 560	2014.01	0.4	0.025
R	56 <=P < 130	2014.01	0.4	0.025

Note: NOx and HC . It has been assumed that all PM emits in the PM_{10} fraction (i.e. 0% $PM_{2.5}$)

Stage V emissions standards were also released in 2019, with tighter standards being imposed for PM on the most powerful NRMM. However, while some new plant is likely to be incorporated within the fleet on such a large site, it is considered unlikely that the NRMM fleet will be significantly comprise of vehicles meeting these higher standards. As the age structure of the NRMM is likely to be a mix of older (Stage IIIB equipment) and newer plant, the assumption of all Stage IIIB is highly conservative and ensures a worst-case assessment.

Emission rates were calculated for each work area (e.g. area of bulk earthworks). For the purposes of modelling It was assumed that emissions were spread uniformly across each area and equally throughout the year.

The emission rates were calculated by following the process below:

1. Define emission rate for each NRMM within a work activity area:
    - Emission rate ($g.s^{-1}$) = operating power (kW) × emission factor (g kWh^{-1}) × number of plant items / 3600 (s h^{-1}).

- Adjust individual NRMM emission rate to account for percentage on-time each day. (e.g. factor by 0.9 if on for 90% of construction hours)

2. Sum the emission factors from all NRMM within a work area
3. Divide each works area's emission rate ($g.s^{-1}$) by the area of the work area (m^2) to give the area adjusted emission factor (($g.m^{-2}.s^{-1}$).

The results were adjusted post-modelling to account for the hours of construction hours (i.e. 7:00 to19:00 Monday to Friday and 7:00 to 16:00 Saturday) and the percentage of the year each work activity/phase will occur.

NO_X:NO_2 conversion factors

Whilst emission standards are provided in terms of nitrogen oxides (NO_X), NO_X converts to nitrogen dioxide (NO_2).

Worst-case NO_X:NO_2 conversion factors (i.e. 70% conversion of long-term NO_X to NO_2) from the Environment Agency's Air Quality Modelling and Assessment Unit (AQMAU) guidance[1] were used in the assessment. This results in a more conservative prediction of impact for construction plant and therefore provides a precautionary approach for these particular emission sources.

Meteorological data

For meteorological data to be suitable for ADMS dispersion modelling purposes, a number of meteorological parameters need to be provided on an hourly sequential basis. These parameters include wind speed, wind direction, cloud cover and temperature, amongst others. The meteorological data site used in this assessment was from Bedford, for the years 2015, 2016 and 2017 (The maximum concentration at each receptor has been presented in the results).

The surface roughness applied to the model for the meteorological station and site was 0.5m.

Model parameters

A summary input table showing further parameters used in the are set out in Table A.3 below.

[1] AQMAU, 'Conversion ratios for NOx and NO_2' https://webarchive.nationalarchives.gov.uk/20140328232919/http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf

Table A.3: ADMS 5 model inputs

Parameter	Value	Source/ Explanation
Velocity of release	0.1m/s	Value recommended by model designer CERC. Likely to be worst-case as exhaust velocity of tail-pipes will be higher
Height of release	1m	Arbitrary height (as recommended by model designer CERC)
Temperature of release	97°C	Cited as being the minimum exhaust temperature for hot release of diesel vehicles. (Gonzalez, 2008) (Heidari & Marr, 2015). This is likely to be a far lower figure than exhaust temperature of large pieces of plant. Modelled results can therefore be considered worst-case for this parameter (i.e. cooler exhaust gases will disperse less effectively).

Model receptors

Modelled receptors were selected to be representative of the closest human health receptors to the construction sites, these receptors are set to the height of 1.5m, above ground level (.e. breathing height). Refer to Table A.4 and Figures 1, 2 and 3 of Appendix C for modelled receptors locations.

These receptors include all those assessed in the Appendix 9.11 of the ES, (Construction phase traffic assessment) as well as the closest receptors to the Main Site, Junction 15 and Roade Bypass.

Table A.4: Modelled Receptors

Receptor			
ID	Location	X	Y
Receptors included in Appendix 9.11 of the ES (Collingtree)			
C1	Collingtree	474979.1	255370
C2	Collingtree	474983.8	255370.3
C3	Collingtree	474988.8	255370.6
C4	Collingtree	474993.7	255370.9
C5	Collingtree	475030	255353.1
C6	Collingtree	474982.6	255401
C7	Collingtree	474975	255419.7
C8	Collingtree	474961.6	255420.3
C9	Collingtree	474954.8	255427.9
C10	Collingtree	474949.9	255433.8
C11	Collingtree	474944	255440.5
C12	Collingtree	474938.8	255446.3
C13	Collingtree	474920.6	255456.8
C14	Collingtree	474915.1	255463.3

Receptor		X	Y
ID	**Location**		
C15	Collingtree	474909.2	255470.3
C16	Collingtree	474882.6	255479.4
C17	Collingtree	474894.9	255486.7
NSSUE1	Collingtree	474624	255809.4
NSSUE2	Collingtree	474744.4	255675.5
NSSUE3	Collingtree	474765.4	255659.7
Receptors included in Appendix 9.11 of the ES (Wootton)			
W1	Wootton/A45 Corridor	475742.5	255971.2
W2	Wootton/A45 Corridor	475853.3	256538.8
W3	Wootton/A45 Corridor	475833.3	256926.7
W4	Wootton/A45 Corridor	475799.4	257259.2
W5	Wootton/A45 Corridor	475669.1	257377.2
Receptors Near Main Site			
CP1	Collingtree Rd/Milton Malsor	474249.7	255602.6
CP2	Milton Malsor/W of rail line	473895.5	255071.7
CP3	Milton Malsor/W of rail line	474079.5	254843.1
CP4	Collingtree Rd/Milton Malsor	474080.5	255524.7
CP5	South of Main Site/ N of Courteenhall Road	474822.1	253283.2
	Receptors Near Roade Bypass		
RCP1	Roade	474920.9	251662
RCP2	Roade	474950.7	251672.2
RCP3	Roade	475360.7	251138.9
RCP4	Roade	475230.6	252170.8
RCP5	Roade	475227.5	252120.2
RCP6	Roade	475546.3	252262.7
RCP7	Roade	474749.1	251841.8
RCP8	Roade	475027.7	250502.9

The impact of on-site emissions was quantitatively assessed at all identified receptor locations in Table A.4 above.

In addition, the combined impact of both on-site emissions and off-site construction traffic emissions was assessed at the receptors which features in Appendix 9.11 of the ES.

Baseline Air Quality (without the proposed development)

For the receptors which were included in the assessment of off-site construction traffic (within Appendix 9.11) (C1- NSSUE3), baseline air quality concentrations were taken from the 'Without 2021' column.

These are summarised in Table A.5 below.

Table A.5: Receptor concentrations (Without development 2021)

Receptor	Concentration (Annual mean (µg.m^{-3}))	
	NO_2	PM_{10}
C1	34.8	19.8
C2	33.5	19.6
C3	32.1	19.3
C4	30.8	19.1
C5	25.0	18.1
C6	27.8	18.5
C7	26.3	18.3
C8	28.7	18.7
C9	28.7	18.7
C10	28.7	18.7
C11	28.6	18.7
C12	28.6	18.7
C13	30.3	19.0
C14	30.3	19.0
C15	30.1	18.9
C16	34.3	19.7
C17	30.0	18.9
NSSUE1	23.2	17.7
NSSUE2	25.4	18.1
NSSUE3	24.7	18.0
W1	17.9	17.6
W2	23.4	18.9
W3	20.0	18.1
W4	23.9	19.0
W5	20.8	18.3

For the other receptors, baseline air quality was sourced from Defra predictions. Defra provides estimated background concentrations of the UKAQS pollutants on the UK Air Information Resource (UK-AIR) website, (http://uk-air.defra.gov.uk). These estimates are produced using detailed modelling tools and are presented as concentrations at central 1sq.km. National Grid square locations across the UK. These predictions are updated as part of the emission factor tool kit. The baseline (background) pollutant concentrations are shown below:

Table A.6: Baseline Pollution Concentrations at Receptors

	NO_2 (Annual mean ($\mu g.m^{-3}$))		PM_{10} (Annual mean ($\mu g.m^{-3}$))	
Receptor	EFT (8) 2021	EFT (9) 2021	EFT (8) 2021	EFT (9) 2021
CP1	13.4	14.6	15.6	16.0
CP2	9.4	10.3	14.0	14.5
CP3	8.8	10.7	14.2	14.4
CP4	13.4	14.6	15.6	16.0
CP5	7.7	8.7	12.8	13.8
RCP1	6.7	8.1	12.6	13.7
RCP2	6.7	8.1	12.6	13.7
RCP3	7.9	9.2	13.6	14.5
RCP4	7.9	9.1	13.2	14.2
RCP5	7.9	9.1	13.2	14.2
RCP6	7.9	9.1	13.2	14.2
RCP7	6.7	8.1	12.6	13.7
RCP8	7.1	8.5	13.0	14.2

Significance Criteria

The latest Environmental Protection UK (EPUK) and IAQM guidance, published in January 2017, on Planning for Air Quality was followed in determining the significance of impacts from pollutants.

The significance of impact of changes in long term average NO_2 and PM_{10} concentrations is derived from both the magnitude of change at a sensitive receptor and the increased pollutnat concentration at that receptor. The significance of impacts can be described as 'negligible', 'slight', 'moderate' or 'substantial', as shown in Table A.7 below. These impact descriptors were taken from latest EPUK and IAQM guidance as follows.

Table A.7. EPUK & IAQM Impact Descriptors

Long term average at receptor in assessment year	Percentage (%) change in concentration relative to AQS				
		>10	6-10	2-5	1
	>110% of AQS	Substantial	Substantial	Substantial	Moderate
	103-109% of AQS	Substantial	Substantial	Moderate	Moderate
	95-102% of AQS	Substantial	Moderate	Moderate	Slight
	76-94% of AQS	Moderate	Moderate	Slight	Negligible
	<75% of AQS	Moderate	Slight	Negligible	Negligible

Note: AQS = Air Quality Standard for NO_2 and PM_{10} ($40\mu g.m^{-3}$).

Whilst the impact descriptors above describe the impact at each individual receptor. The overall judgment of significance is based on professional judgement and should take account of:

- The exposure of the receptors with the proposed development
- The number of receptors with slight, moderate or substantial impacts;
- The spatial and temporal scale of any impacts.
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Given that any impacts associated with the construction phase of the proposed development will be temporary, increases in pollution concentrations that result in concentrations below the relevant AQSs (set out below) will likely be insignificant.

However, if on-site traffic and NRMM emissions cause a receptor to exceed the relevant AQS due to large increases in pollution, then impacts should be considered significant.

Air Quality Standards

The Air Quality Standards (AQS) of importance to this assessment are summarised below.

Table A.8: UK Air Quality Standards for NO_2 and PM_{10}

Pollutant	Averaging Period	Air quality standard (AQS) ($\mu g.m^{-3}$)	Air quality objective	Objective: to achieve the standard by
Nitrogen dioxide (NO_2)	1 hour	200	200 $\mu g.m^{-3}$ not to be exceeded more than 18 times a year	31 December 2005
	Annual	40	40 $\mu g.m^{-3}$	31 December 2005
Particulate Matter (PM_{10})	24 hour	50	50 $\mu g.m^{-3}$ not to be exceeded more than 35 times a year	31 December 2004
	Annual	40	40 $\mu g.m^{-3}$	31 December 2004

With regard to the hourly AQS for NO_2 (i.e. 200$\mu g.m^{-3}$ not to be exceeded more than 18 times a year), LAQM.TG(16) states that if the annual mean is below 60$\mu g.m^{-3}$ then this AQS should be met.

With regard to the daily mean AQS for PM_{10} (i.e.50$\mu g.m^{-3}$ not to be exceeded more than 35 times a year), LAQM.TG(16) provides an equation that can be used to derive the number of likely daily exceedances from an annual mean concentration. The equation indicates that if annual mean concentrations of PM_{10} are below 31.8$\mu g.m^{-3}$ then this AQS should be met.

For comparison with these standards, all results presented as annual averages.

Annex 1: Summary of Assumptions for on-site Dispersion Modelling Assessment

Table A1.1: Main Site Earthworks and Groundworks

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year 4	BS 5228 Ref		kW
Bulk Earthworks and On-Site Infrastructure.	Within the area defined by Phase 2 Bulk earthworks in the Main Site Phasing Plan. This area covers parts of Works area 4, 3 and 6.	70T tracked excavator	2	90	100%	C2.14	Tracked Excavator, 226 kW - 40t	226
		40T tracked excavator	3	90	100%	C2.14	Tracked Excavator, 226 kW - 40t	226
		30T tracked excavator	5	90	100%	C2.16	Tracked Excavator, 170 kW - 30t	170
		30T articulated dumper	15	90	100%	C4.1	Articulated dump truck*, 194 kW - 25t	194
		18T tracked dozer	8	90	100%	C2.12	Dozer, 142 kW - 20t	142
		20T single drum roller	6	90	100%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		Tractor	2	40	100%	C4.04	Tractor (adjusted, C4.04 Dumper Spectrum +10 dB)	75
		Road paver	1	60	100%	C5.31	Asphalt paver (+tipper lorry), 94 kW - 18t	94
		Tractor and bowser	1	50	100%	C4.04	Tractor (adjusted, C4.04 Dumper Spectrum +10 dB)	75
Main Farm Building Demolition	Within the area defined by Phase 2 Bulk	35T Excavator	2	90	12%	C1.13	Tracked excavator, 205 kW, - 40t	205
		Breaker on tracked excavator	1	40	12%	C1.09	Breaker mounted on excavator, 121kW, - (15t) 1650kg breaker	121

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year 4	BS 5228 Ref		kW
(Phase 2 Bulk Earthworks	earthworks in the Main Site Phasing Plan. This area is within works Area 4.	Crusher	1	50	12%	C1.15/ C1.14	Tracked Crusher	172
Main Site Groundworks	Works Area 4 – within the areas defined as Zone A1a and A4 in the Parameters Plan.	20T Tracked Excavator	2	60	60%	C2.3	Tracked Excavator, 102 kW - 22t	102
		12T Tracked Excavator	2	60	60%	C2.5	Tracked Excavator, 72 kW - 16t	72
		12T Dumper	4	40	60%	C2.32	Articulated dump truck (tipping fill), 187 kW - 23t	187
		Twin roller	2	30	60%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		Disc cutter	5	5	60%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	3
Rail Terminal Ground works & Rail Terminal	Works Area 2	20T Tracked Excavator	3	60	100%	C2.3	Tracked Excavator, 102 kW - 22t	102
		8T Tracked Excavator	3	60	100%	C4.17	Tracked Excavator 41 8t	41
		20T single drum roller	2	30	100%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		Twin Drum Roller	2	20	100%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		A35 Dumper	5	20	100%	C4.1	Articulated dump truck*, 194 kW - 25t	194

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year 4	BS 5228 Ref		kW
		12T Dumper	5	30	100%	C2.33	Articulated dump truck*, 187 KW - 23t	194
		Heavy Breaker on Excavator	1	20	100%	C1.09	Breaker mounted on excavator, 121kW, - (15t) 1650kg breaker	121
		Disc Cutter	5	5	100%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	3
		Concrete Pump	1	100	100%	C3.26	Concrete Pump	25
		Concrete Pokers	3	30	100%	C4.33/ C.4.34	Poker Vibrator	2.2
		Power Float	3	100	100%	D6.44	Power Float adjusted C4.90 - 1dB	3
		Power Float	3	100	100%	D6.44	Power Float adjusted C4.90 - 1dB	3

Table A1.2: SRFI railway Construction

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year4	BS 5228 Ref		kW
Container loading area	Works area 1 + 3	Concrete pump	1	90	100%	C3.26	Concrete Pump	25
		Concrete pokers	4	50	100%	C4.33/ C.4.34	Poker Vibrator	3
		20t excavator	2	65	100%	C2.03	Tracked Excavator, 102 kW - 22t	102
		Small tools	N/A	5	100%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	
Ballast works	Works area 1 + 3	20t excavator	2	75	100%	C2.03	Tracked Excavator, 102 kW - 22t	102
		10t dumper	1	75	100%	C4.04	Dumper*, 75 kW - 9t	75
		D5 dozer	1	75	100%	C2.12	Dozer, 142 kW - 20t	142
P. way work	Works area 1 + 3	20t excavator	2	75	100%	C2.03	Tracked Excavator, 102 kW - 22t	102
		Road rail excavator	1	60	100%	C2.03	Tracked Excavator, 102 kW - 22t	102
Walkways	Works area 1 + 3	10t dumper	1	75	100%	C4.04	Dumper*, 75 kW - 9t	75
		Wacker plate	1	20	100%	C2.41	Vibratory plate (petrol), 3 kW, 62 kg	3
		8t excavator	1	75	100%	C4.17	Tracked Excavator 41 8t	41

Table A1.3: Road and Warehouse Construction

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year 4	BS 5228 Ref		kW
Road Construction -Part 1	Works Area 5 – Phase 1 as shown in the Main Site Phasing Plan.	35T excavator	3	90	45%	C2.14	Tracked Excavator, 226 kW - 40t	226
		35T Dumpers	8	90	45%	C4.01	Articulated dump truck*, 194 kW - 25t	194
		D6 Dozer	2	70	45%	C2.12	Dozer, 142 kW - 20t	142
		20T vibrating rollers	4	70	45%	C5.22	Vibratory roller*, 92 kW - 12t	92
Road Construction - Part 2	Works Area 5 – Phase 2 as shown in the Main Site Phasing Plan.	20T tracked excavators	3	60	55%	C2.03	Tracked Excavator, 102 kW - 22t	102
		twin drum rollers	2	30	55%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		9T dumpers	4	30	55%	C4.04	Dumper*, 75 kW - 9t	75
		Disc Cutters	2	5	55%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	3
Road Construction - Part 3	Works Area 5 – Phase 3 as shown in the Main Site Phasing Plan.	Asphalt paver	1	60	30%	C5.31	Asphalt paver (+tipper lorry), 94 kW - 18t	94
		10T rollers	2	50	30%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		Floor saw	1	5	30%	C4.71/ C4.72	Circular bench saw (petrol-cutting concrete blocks)	3
		Back hoe hydraulic breaker	1	5	30%	C5.1	Backhoe mounted hydraulic breaker, 67 kW	67

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year 4	BS 5228 Ref		kW
Concreting Activities	Works Area 4 – within the areas defined as Zone A1a and A4 in the Parameters Plan.	Concrete Silo and Ready Mix Lorries	10	75	100%	C4.2/C 4.210	Concrete Mixer Truck	216
		Diesel Generators	2	100	100%	C4.78/ C4.75	Diesel generator	6.5
		Concrete Saw	2	30	100%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	3
		Poker vibrator	5	50	100%	C4.33	Poker Vibrator	2.2
		Concrete Pumps	2	50	100%	C4.30/ C4.26	Truck mounted concrete pump & Boom arm	363.4
		Power Float	2	100	100%	D6.44	Power Float adjusted C4.90 - 1dB	3
Main Build	Works Area 4 – within the areas defined as Zone A1a and A4 in the Parameters Plan.	Mobile Crane	3	80	60%	C4.39	Mobile telescopic crane (315kW 80t)	315
		Diesel Generators	4	100	60%	C4.78/ C4.76	Diesel generator	6.5
		Hydraulic Access Platform	10	80	60%	C4.57	Lifting Platform 35kW 8t	35
		Concrete Pumps	2	50	60%	C4.30/ C4.26	Truck mounted concrete pump & Boom arm	363.4
		Forklift	3	70	60%	C7.93	Site Fork Lift Trucks 32 Kw (C4.57 spectrum +9 dB)	32
		Wheeled Excavator	2	70	60%	C4.12	Wheeled Excavator	63

Table A1.4: Roade Bypass

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year4	BS 5228 Ref		KW
Bypass Enabling Works	Works Area 13	40T tracked excavator	3	90	100%	C2.14	Tracked Excavator, 226 kW - 40t	226
		D6 Dozer	2	90	100%	C2.12	Dozer, 142 kW - 20t	142
		20T vibrating roller	3	90	100%	C5.22	Vibratory roller*, 92 kW - 12t	92
		35T dumpers	8	90	100%	C4.01	Articulated dump truck*, 194 kW - 25t	194
		12T excavators	2	60	100%	C2.05	Tracked Excavator, 72 kW - 16t	72
		9T dumpers	2	40	100%	C4.04	Dumper*, 75 kW - 9t	75
		Disc Cutters	2	5	100%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	3
		Concrete Pump	1	90	100%	C3.26	Concrete Pump	25
		Concrete vibrating pokers	1	50	100%	C4.33/ C4.34	Poker Vibrator	2.2
Bypass Road Construction - Part 1	Works Area 13	35T Dumpers	8	90	100%	C4.01	Articulated dump truck*, 194 kW - 25t	194
		35T excavator	3	90	100%	C2.14	Tracked Excavator, 226 kW - 40t	226
		D6 Dozer	2	70	100%	C2.12	Dozer, 142 kW - 20t	142
		20T vibrating rollers	4	70	100%	C5.22	Vibratory roller*, 92 kW - 12t	92
Bypass Road Constructi	Works Area 13	20T tracked excavators	3	60	100%	C2.03	Tracked Excavator, 102 kW - 22t	102
		twin drum rollers	2	30	100%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		9T dumpers	4	30	100%	C4.04	Dumper*, 75 kW - 9t	75

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year4	BS 5228 Ref		KW
on - Part 2		Disc Cutters	2	5	100%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	3
Bypass Road Construction - Part 3	Works Area 13	Asphalt paver	1	60	100%	C5.31	Asphalt paver (+tipper lorry), 94 kW - 18t	94
		10T rollers	2	50	100%	C2.37	Roller (rolling fill)*, 145 kW - 18t	145
		Floor saw	1	5	100%	C4.71/ C4.72	Circular bench saw (petrol-cutting concrete blocks)	3
		Back hoe hydraulic breaker	1	5	100%	C5.1	Backhoe mounted hydraulic breaker, 67 kW	67
Bridge over Rail Line (Bypass)	Works Area 13	Piling Rig 900mm auger rig	1	90	100%	C3.21	Crawler mounted rig, 150 kW, 35t	150
		Concrete Pump	1	90	100%	C3.26	Concrete Pump	25
		Disc Cutters	2	4	100%	C5.36	Hand-held circular saw (petrol), 3 kW - 300mm diameter / 9.2kg	3
		9T dumpers	2	20	100%	C4.04	Dumper*, 75 kW - 9t	75
		12T excavators	1	40	100%	C2.05	Tracked Excavator, 72 kW - 16t	72
		Crane 55T	1	10	100%	C4.45	Mobile telescopic crane, 260kW 55t	260
		Concrete pokers	2	50	100%	C4.33	Poker Vibrator	2.2

Table A1.5: J15 Highway Improvement Works

Activity	Location in Year 4	Plant / Equipment	Quantity	On-time (%) per day	% of days in Year4	BS 5228 Ref		KW
J15 improvements works	Works Area 8	30T excavator	2	90%	50%	C2.16	-Tracked Excavator; 170KW;30T	124
		25 T excavator	3	90%	50%	C2.19	- Tracked Excavator; 125KW;25T	125
		6T excavator	5	90%	50%	C5.34	- Tracked Excavator; 170KW;30T	51
		tipper lorries	3	90%	50%	C5.31	- Tracked Excavator; 51KW;7T	94
		6t forward tipping dumpers	5	90%	50%	C4.06	-Dumper;60kW; 6T	60
		D6 Dozers	4	90%	50%	C.2.12	-Dumper; 142kW; 20T	142
		Twin drum Roller	4	90%	50%	C.5.19	-Road roller' 95kW; 22T	95
		Paver	1	90%	50%	C.5.30	- Asphalt paver (+ tipper lorry); 112kW; 12T hopper	112

Table A1.6: Emission Factors ($g.m^{-2}.s^{-1}$)

Area	NO_X ($g.m^{-2}.s^{-1}$)	PM_{10} ($g.m^{-2}.s^{-1}$)
Earthworks Phase 2 (Works Area 3,4 &6)	0.00000433900659	0.00000005337504
Construction Year 4 (including groundworks) (Works Area 4)	0.00000673961224	0.00000007789056
Road Phase 1(Works Area 5)	0.000045032591132	0.000000527081108
Road Phase 2(Works Area 5)	0.000018489197531	0.000000154706790
Road phase 3(Works Area 5)	0.000005063601189	0.000000053165322
Rail Terminal (Works Area 2)	0.00000585418166673	0.00000005587551794
Rail infrastructure (Works Area 1-3)	0.000003461517180096	0.000000026793574580
Roade Bypass (Works Area 13)	0.00001190770772	0.00000013238453
Junction 15 (Works Area 8)	0.00000853106607	0.00000007092710

Table A1.7: Traffic movements on Haul roads (AADT)

Site	AADT (Year 4)	
	HDV	LDV
Main Site	185	425
Roade (18 months of traffic in 12 months)	129	212

Note: This information has been adapted from the one way flows set out in Appendix 33 of the Transport Assessment (ES Appendix 12.1). The figures have been provided by the Transport consultant for the project.

Appendix B

Qualitative Assessment - Methodology

Guidance

The qualitative assessment of impacts from on-site construction activities follows Defra LAQM.TG(16) (7.22 to 7.23). It states that the potential for on-site plant also referred to as "Non Road Mobile Machinery" (NRMM) and site traffic to adversely affect local air quality is dependent upon the following considerations (criteria):

1. *"Duration of works and associated phasing plans;*
2. *Type and number of NRMM to be used on site;*
3. *Operating hours of NRMM;*
4. *Emissions standards to which NRMM comply;*
5. *Proximity of receptors to NRMM working areas; and*
6. *Existing background pollutant concentrations.*

Table 3 included in the response to the Secretary of State's questions includes reference to the above numbered criteria.

LAQM.TG(16) (7.26) guidance also states that:

> *"Experience of assessing the exhaust emissions from on-site plant (NRMM) and site traffic suggests that, with suitable controls and site management, they are unlikely to make a significant impact on local air quality. In the vast majority of cases they will not need to be quantitatively assessed – qualitative consideration to the above points will likely provide sufficient screening."*

The above component of the guidance provides the context for the approach taken in the assessment to date, with a qualitative approach and a judgement that the negligible nature of the likely emissions from on-site NRMM and on-site site traffic did not warrant further consideration or assessment.

Sensitive receptors

The assessment considers the relative emission magnitude and relative distance to receptors to determine if a significant impact is likely at sensitive receptor.

LAQM.TG(16) (7.132) sets out minimum distance criteria for establishing background monitoring stations, to ensure there is no addition influence of local pollution sources i.e. where background concentrations are expected to occur. It states:

> *"For urban background or suburban sites there should be no major sources of pollution (for example a large multi-storey car park) within 50m. There should be no medium sized emission sources (for example, petrol stations, boiler vents, or ventilation outlets to catering establishments) within 20m."*

This means concentrations drop-off to background levels at up to 50m from a source (for small on-site construction sources the drop off to background levels will be far

shorter), for this assessment receptors were identified at 20m for a conservative/precautionary approach as well as at 50m. For the purpose of this assessment receptors were identified within the buffer zones of 20m and 50m, as provided in Appendix C Figures 4 – 15.

Significance of impacts

The significance of impacts on receptors is reliant on several key factors:

- The number and type of on-site NRMM and on-site vehicles;
- the total hours of operation over a year;
- distance to and existence of receptors;
- the air quality (background) conditions at receptor locations; and
- critically, how close the background conditions are to the Air Quality Standard (AQS).

As any impact from the construction phase will be temporary, the key criterion for judging whether an impact is significant or not relates to whether emissions are likely to cause an exceedance or elevation of concentrations above the relevant long-term AQS. If the background concentration is significantly lower than the AQS, then there is likely to be sufficient headroom to not cause an exceedence of the AQS and therefore there is not likely to be a significant effect from the on-site emissions. Note: AQS for NO_2 and PM_{10} = 40µg.m^{-3} (annual average).

Assessment methodology

The qualitative assessment for each Work Sites was undertaken following the LAQM.TG(I6) guidance.

The "Qualitative On-Site Air Quality Assessments" provides results following an assessment of each Work Sites' input data to provide an overall assessment of significance. As stated above the key factors on each site are assessed to determine if there is a significant effect, with a summary of criteria which evidences the results.

Assessment input data

Works schedule data provided information on NRMM type, number and operational time for each Work Site. See Table B.1 below

Table B.1 Northampton Gateway - Schedule of Plant

Work Package	Plant/NRMM	Duration
7 - A508 Access	1No. 30T excavator, 2No. 25T excavator, 3No. 6T excavators, 3No. 30T dumpers, 3No. 6T forward tipping dumpers, 2No. D6 dozers, 2No. Twin drum rollers, 1No. paver	48 weeks
8&9 - M1 J15	2No. 30T excavator, 3No. 25T excavator, 5No. 6T excavators, 3No. Tipper lorries, 5No. 6T forward tipping dumpers, 3No. D6 dozers, 3No. Twin drum rollers, 1No. paver	78 weeks
10 - Foul drainage	1No. 13T excavator, 1No. 6T forward tipping dumper, 1No. twin drum roller	10 weeks
11 - M1 J15A	2No. 25T excavator, 2No. 6T excavators, 4No. Tipper lorries, 2No. 6T forward tipping dumpers, 1No. D6 dozers, 2No. Twin drum rollers, 1No. paver	24 weeks
12 - A508 cycleway	1No. 13T excavator, 1No. 6T forward tipping dumper, 1No. twin drum roller, 1No. Tractair	10 weeks
14 - Rookery Lane	2No. 30T excavator, 1No. 25T excavator, 2No. 6T excavators, 3No. Tipper lorries, 2No. 6T forward tipping dumpers, 1No. D6 dozers, 1No. Twin drum rollers, 1No. paver	26 weeks
15 - Pury Road	1No. 13T excavator, 1No. 6T forward tipping dumper, 1No. twin drum roller	6 weeks
16 - Blisworth Road	1No. 13T excavator, 1No. 6T forward tipping dumper, 1No. twin drum roller	8 weeks
17 - Grafton Regis	1No. 13T excavator, 1No. 6T forward tipping dumper, 1No. twin drum roller	6 weeks

Assessment Criteria

Criteria 1:
Each Work Site "Works duration" in weeks was identified above in Table B.1.

Criteria 2:
Number of NRMM was identified above in Table B.1.

Criteria 3:
Each Work Sites "Operational time" was ratioed over a year from the "Works duration" data (above) in combination with the period of operation at each Work Site, these were sourced from the CEMP, Appendix 01 – Indicative Master Programme. The results were adjusted to account for the normal on-site operational hours (i.e. 7:00 to 19:00 Monday to Friday and 7:00 to 16:00 Saturday).

Criteria 4:
Emissions Standards were sourced from Stage IIIB standards, as specified in the NRMM (Emission of Gaseous and Particulate Pollutants) Regulations 1999. This is a worst-case assumption as the proposed contractor has confirmed that all NRMM will *at least* be Stage IIIB. Stage IV and Stage V engines have far more stringent emission standards.

Criteria 5:
Number of receptors within 20 and 50m of the Work Site boundary.

Criteria 6:
Background concentrations of the UK AQS pollutants on the UK Air Information Resource (UK-AIR) website, (http://uk-air.defra.gov.uk). These estimates are produced using detailed modelling tools and are presented as concentrations at central 1sq.km. National Grid square locations across the UK. These predictions are updated as part of the Defra emission factor tool kit (EFT) and at the time of the original assessment the version of the EFT was version 8. Defra have since released another EFT (v9) in May 2019, therefore to provide a conservative approach to the assessment has used the maximum background concentrations for both the EFTs for the year 2021, these are presented in the results Table 3.

Appendix C

Figures

Figure 1. Main Site model receptors

Figure 2. Roade Bypass model receptors

Figure 3. Junction 15 (Collingtree) model receptors

Figure 4. J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9 (a – Collingtree))

Figure 5. J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9 (b – J15/A45))

Figure 6. J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9 (c –Watering Lane))

Figure 7. A45 N of J15 Wootton (Works No. 10)

Figure 8. Junction 15a (Works No. 11)

Figure 9. A508 adjacent to site entrance (Works No. 7)

Figure 10. Courteenhall Road (Blisworth) junction improvement (Works No.12)

Figure 11. Rookery Lane / Ashton Road junction improvement (Works No. 14)

Figure 12. Pury Road junction improvement (Works No. 15)

Figure 13. Knock Lane / Stoke Road junction improvement (Works No. 16a)

Figure 14. Knock Lane / Stoke Road junction improvement (Works No. 16b)

Figure 15. A508 at Grafton Regis/Church Lane junction improvement (Works No. 17)

Figure 16. Main Site Bulk Earth Works

Figure 17. Main Site Construction Zones

Figure 18. Main Site J15 improvements, Rail Terminal and Infrastructure, Phased Roads and Haul Road works areas

Figure 1. Main Site model receptors

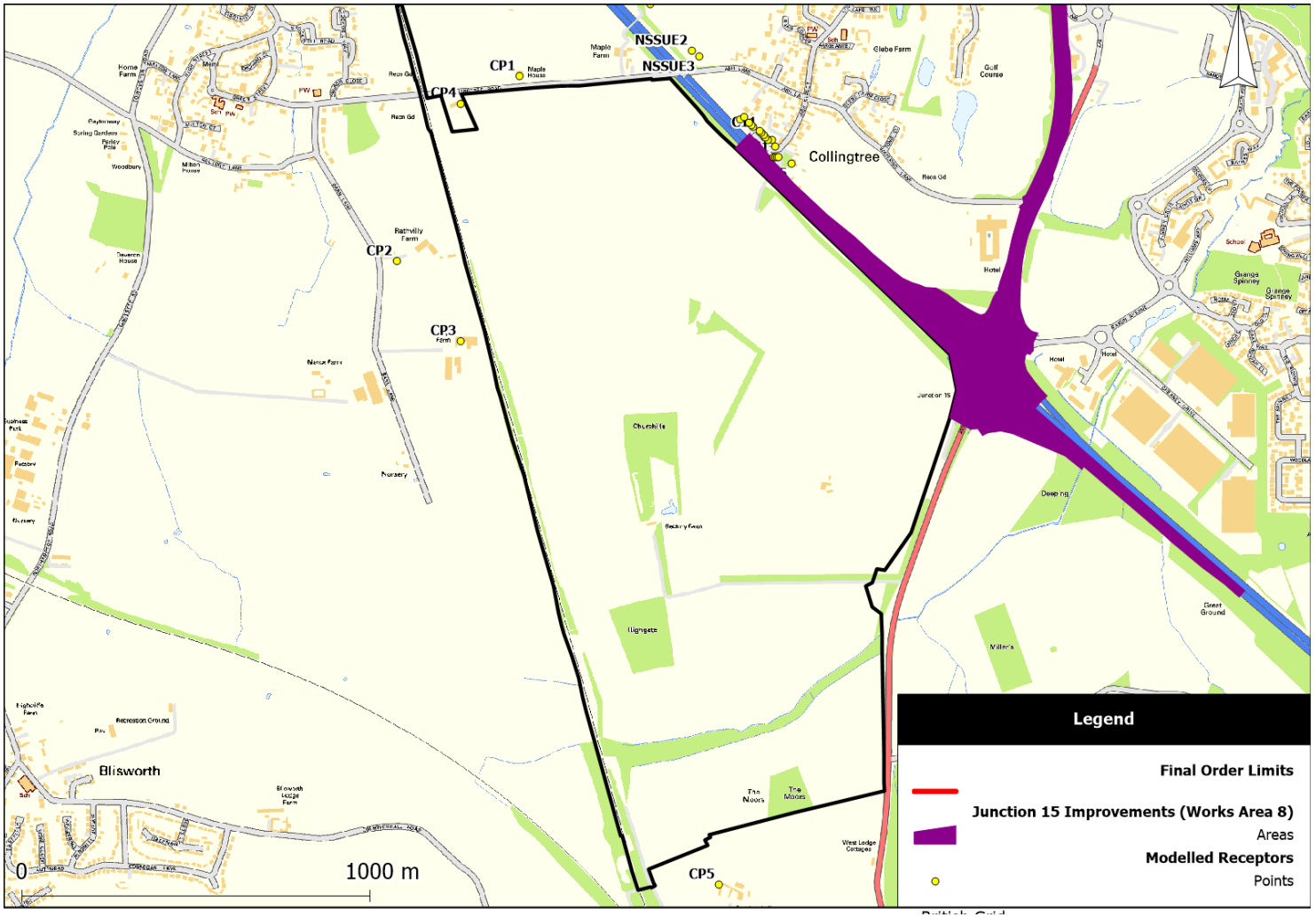

Figure 2. Roade Bypass model receptors

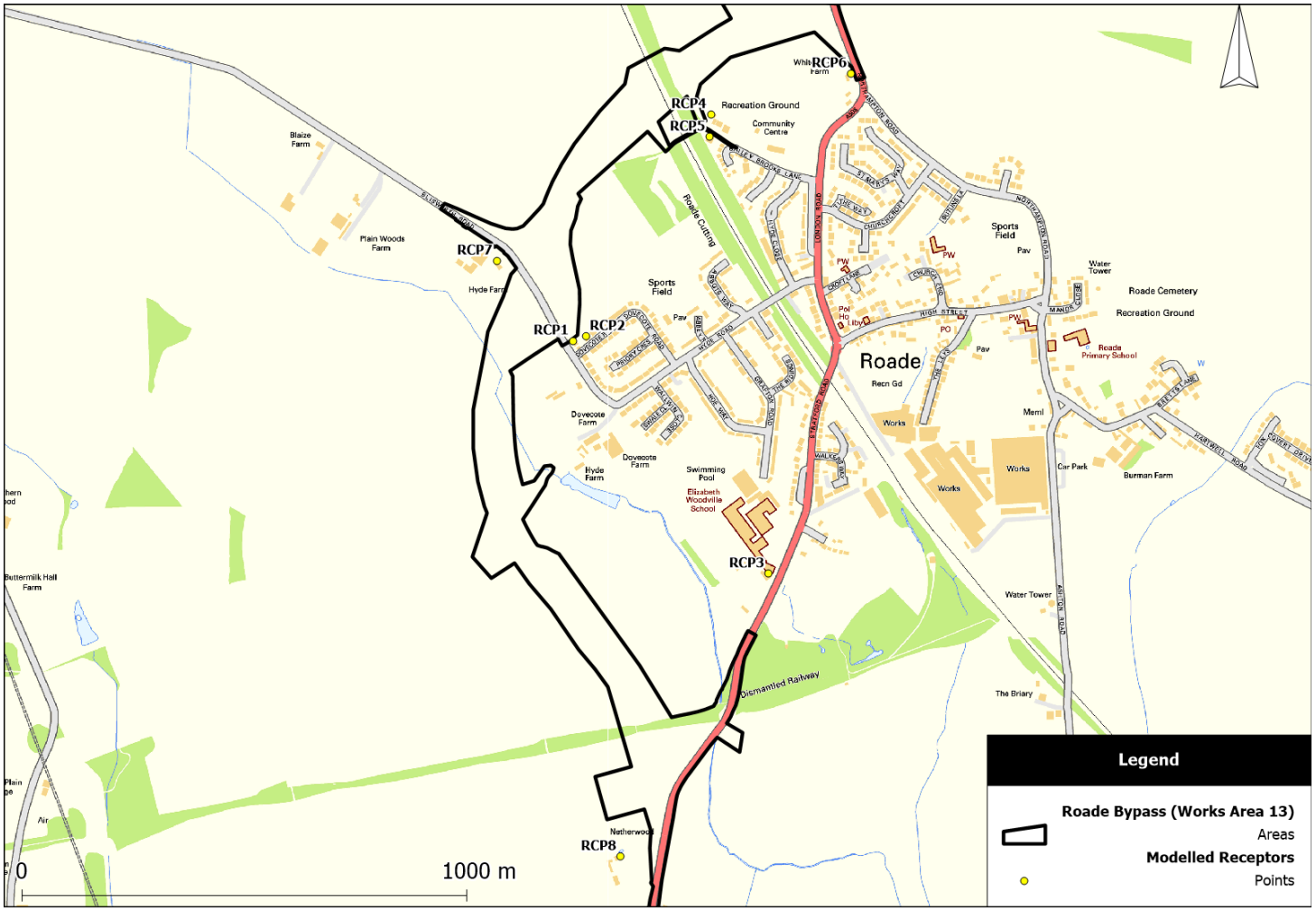

Figure 3. Junction 15 (Collingtree) model receptors

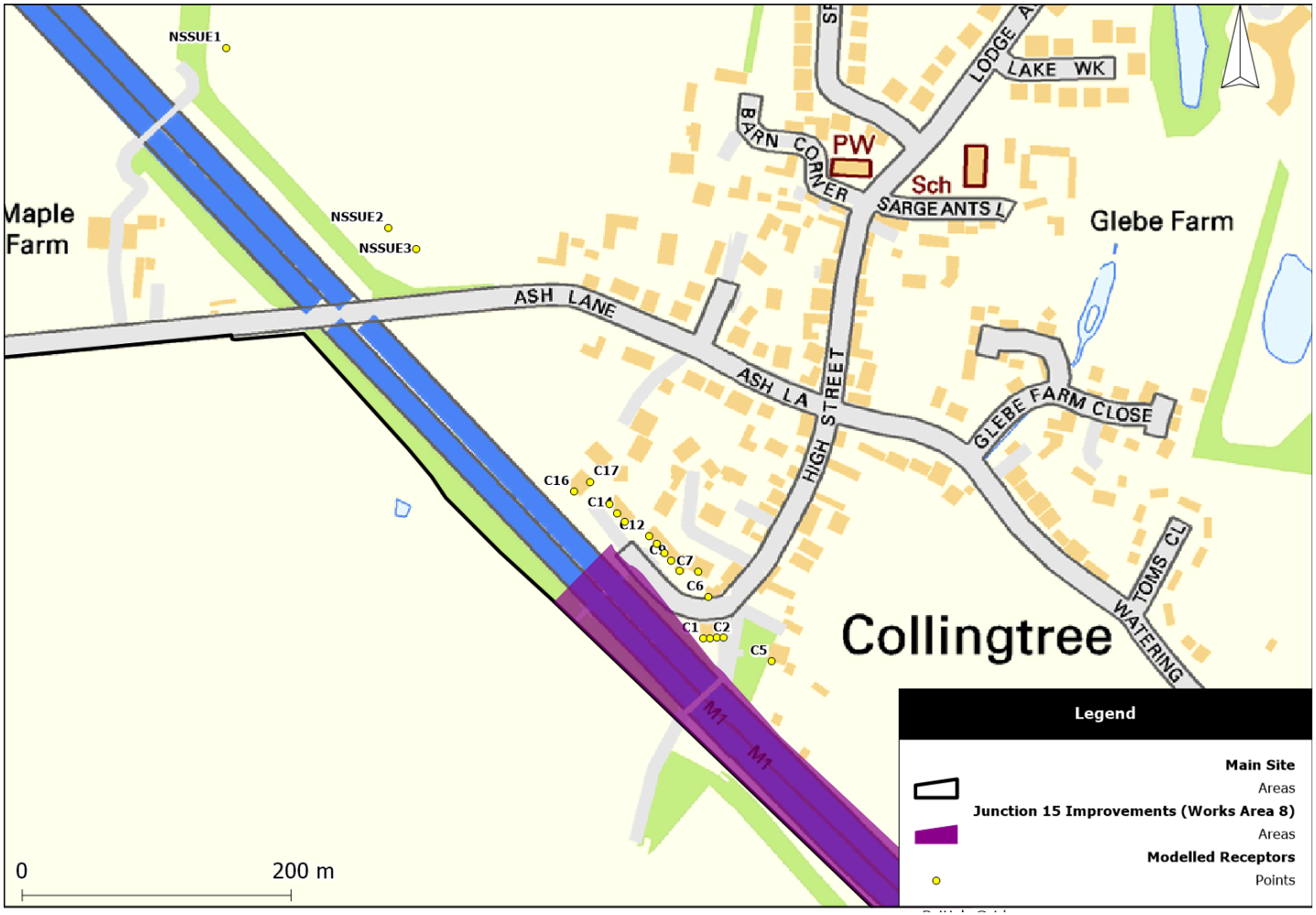

Figure 4. J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9 (a – Collingtree))

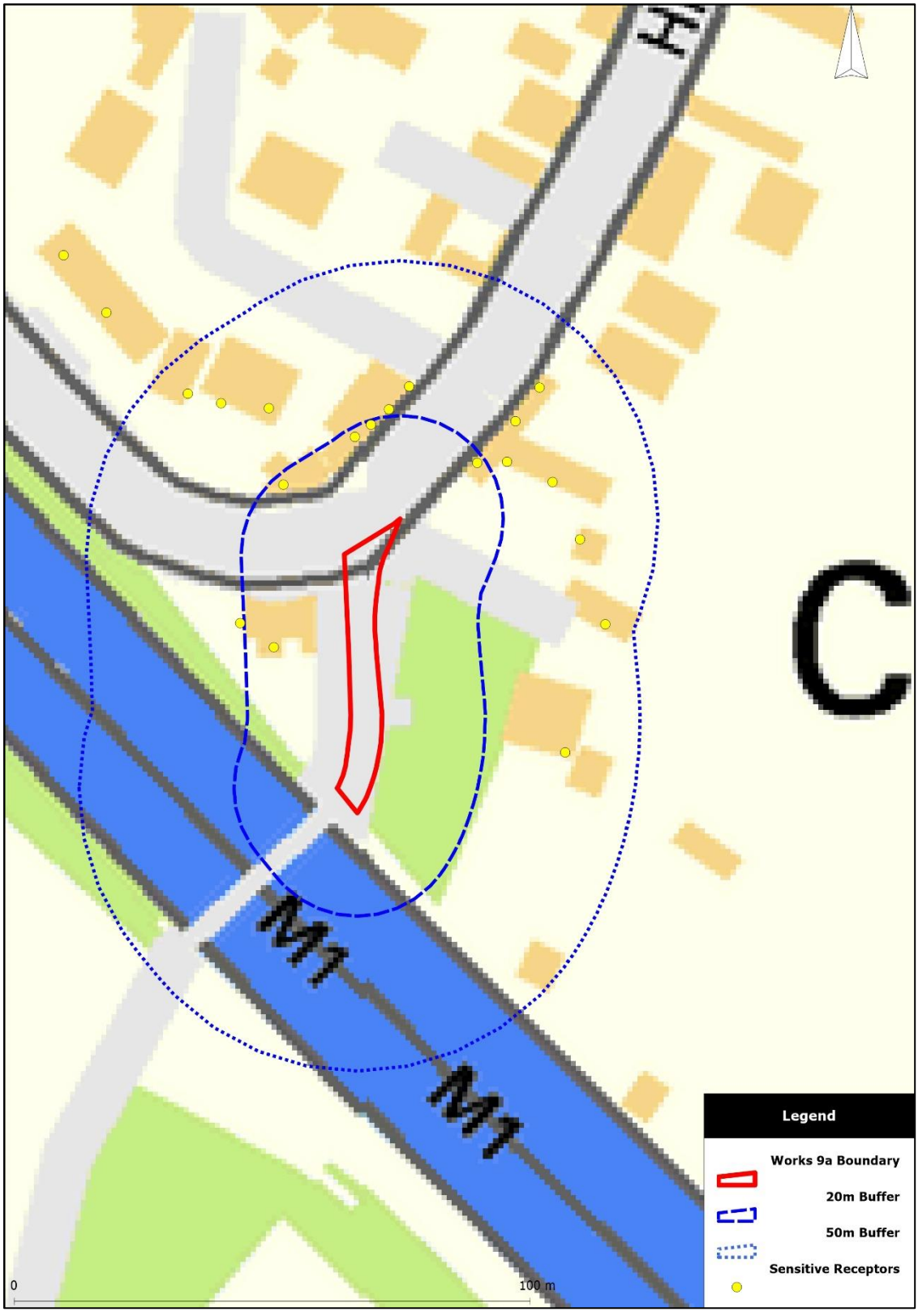

Figure 5. J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9 (b – J15/A45))

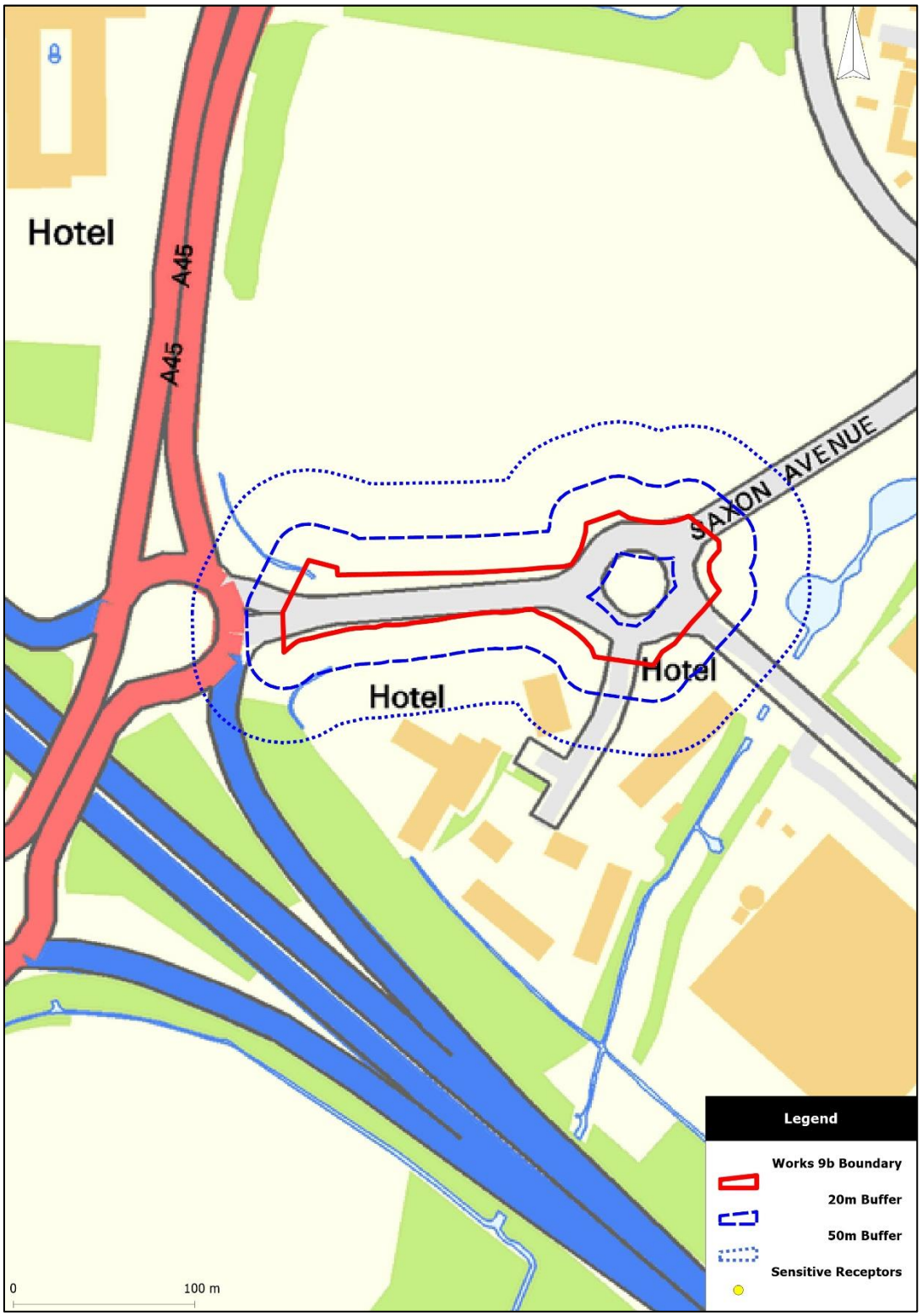

Figure 6. J15 M1 - Saxon Ave/C67/ Collingtree (Works No. 9 (c –Watering Lane))

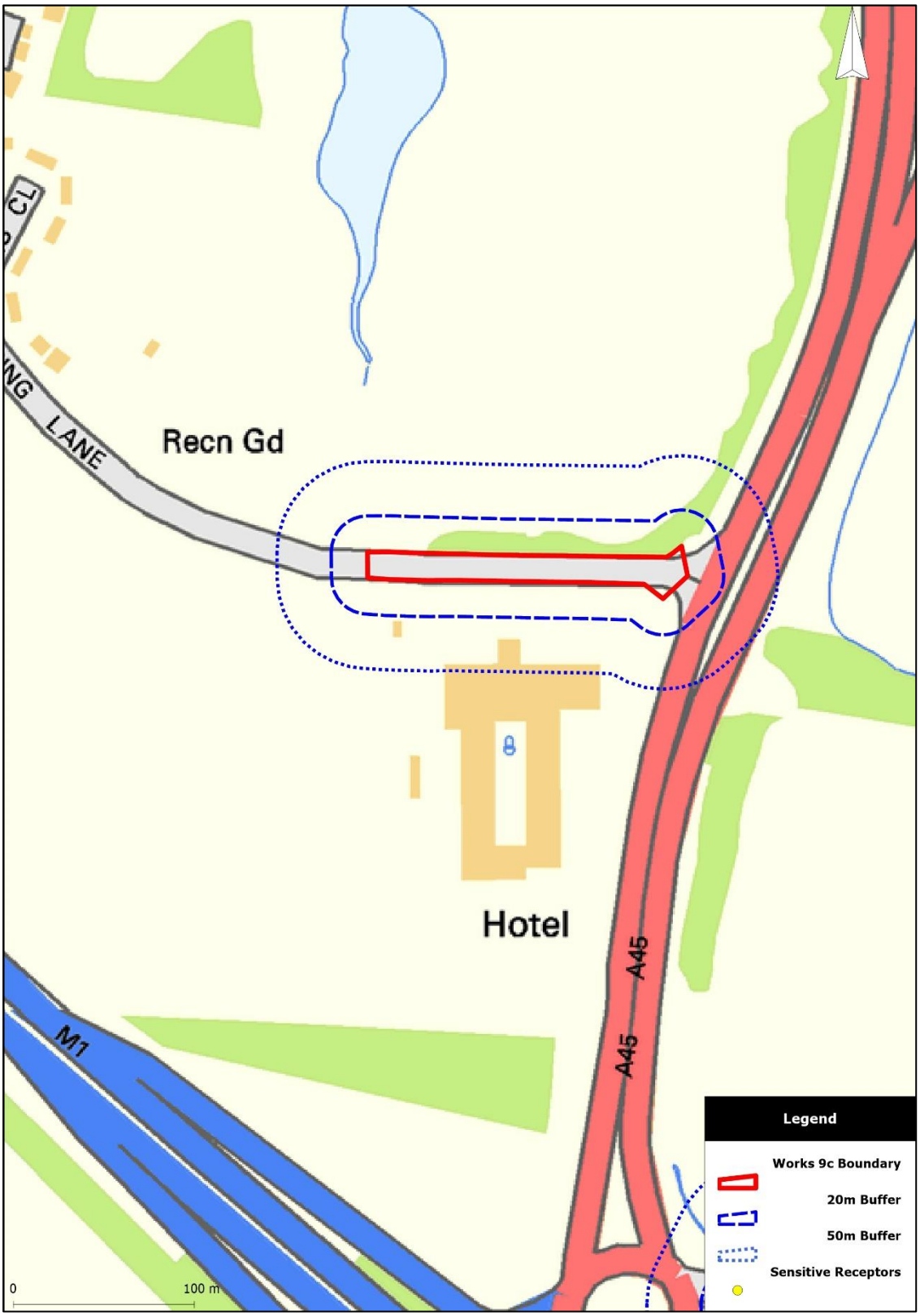

Figure 7. A45 N of J15 Wootton (Works No. 10)

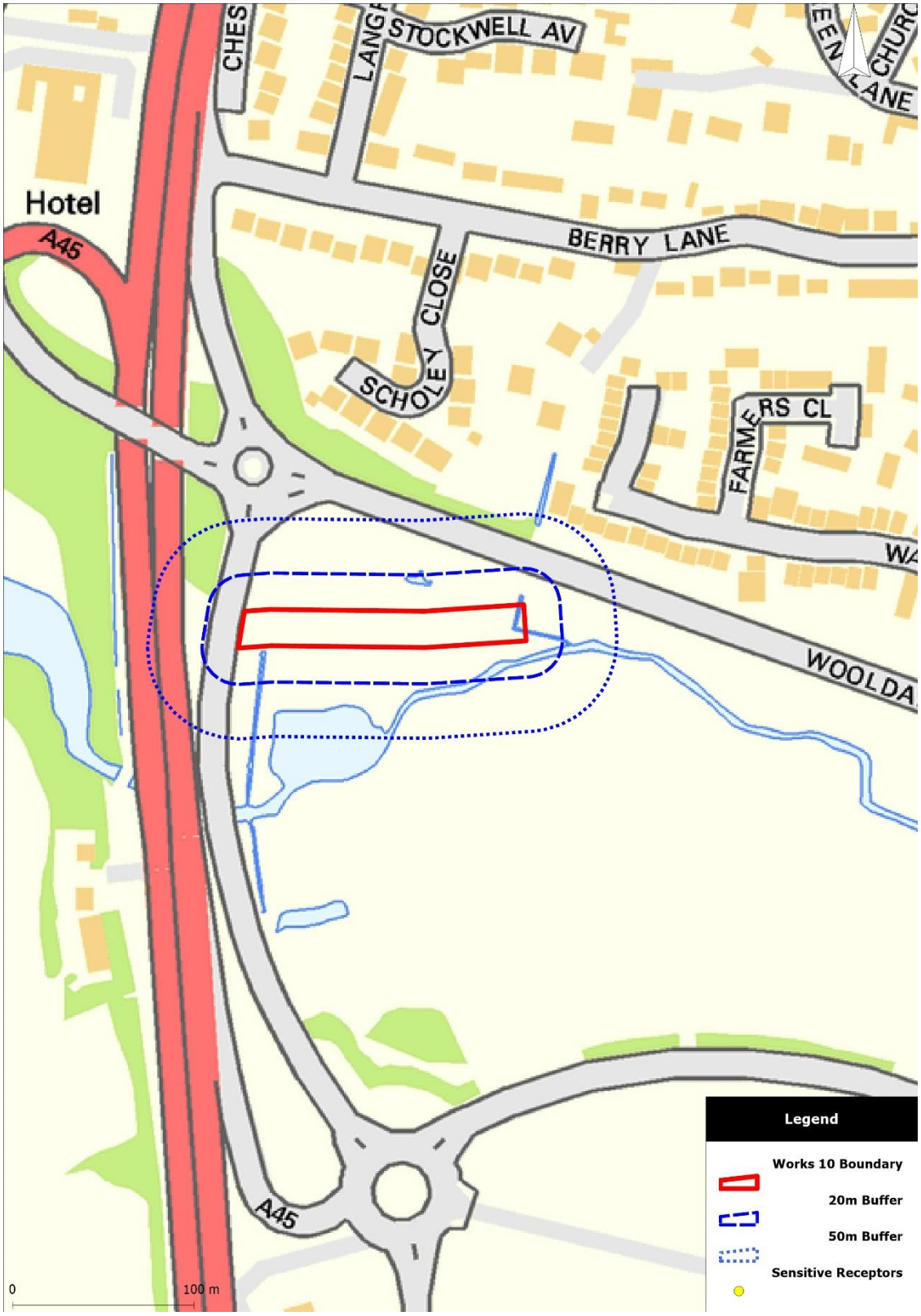

Figure 8. Junction 15a (Works No. 11)

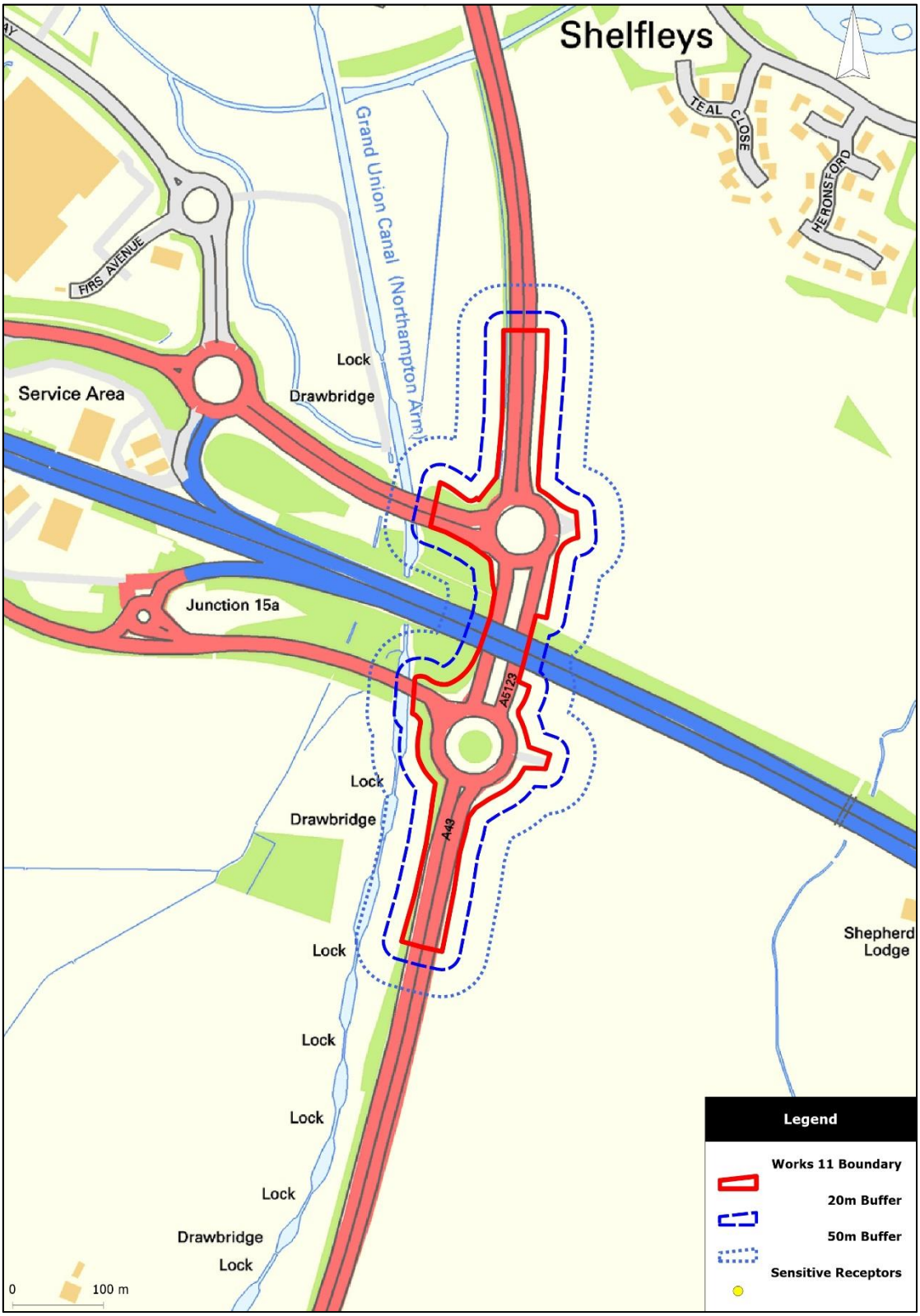

Figure 9. A508 adjacent to site entrance (Works No. 7)

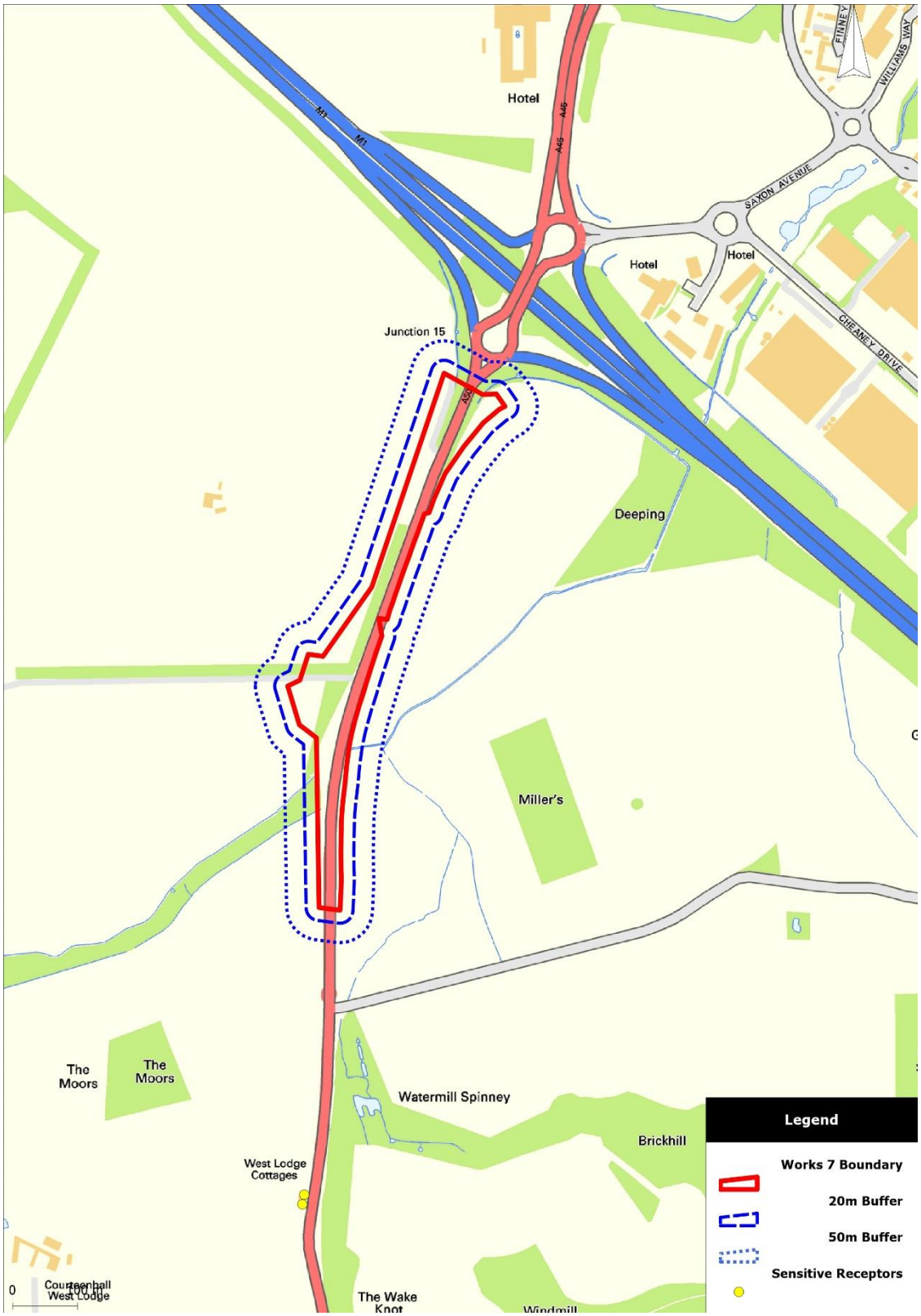

Figure 10. Courteenhall Road (Blisworth) junction improvement (Works No.12)

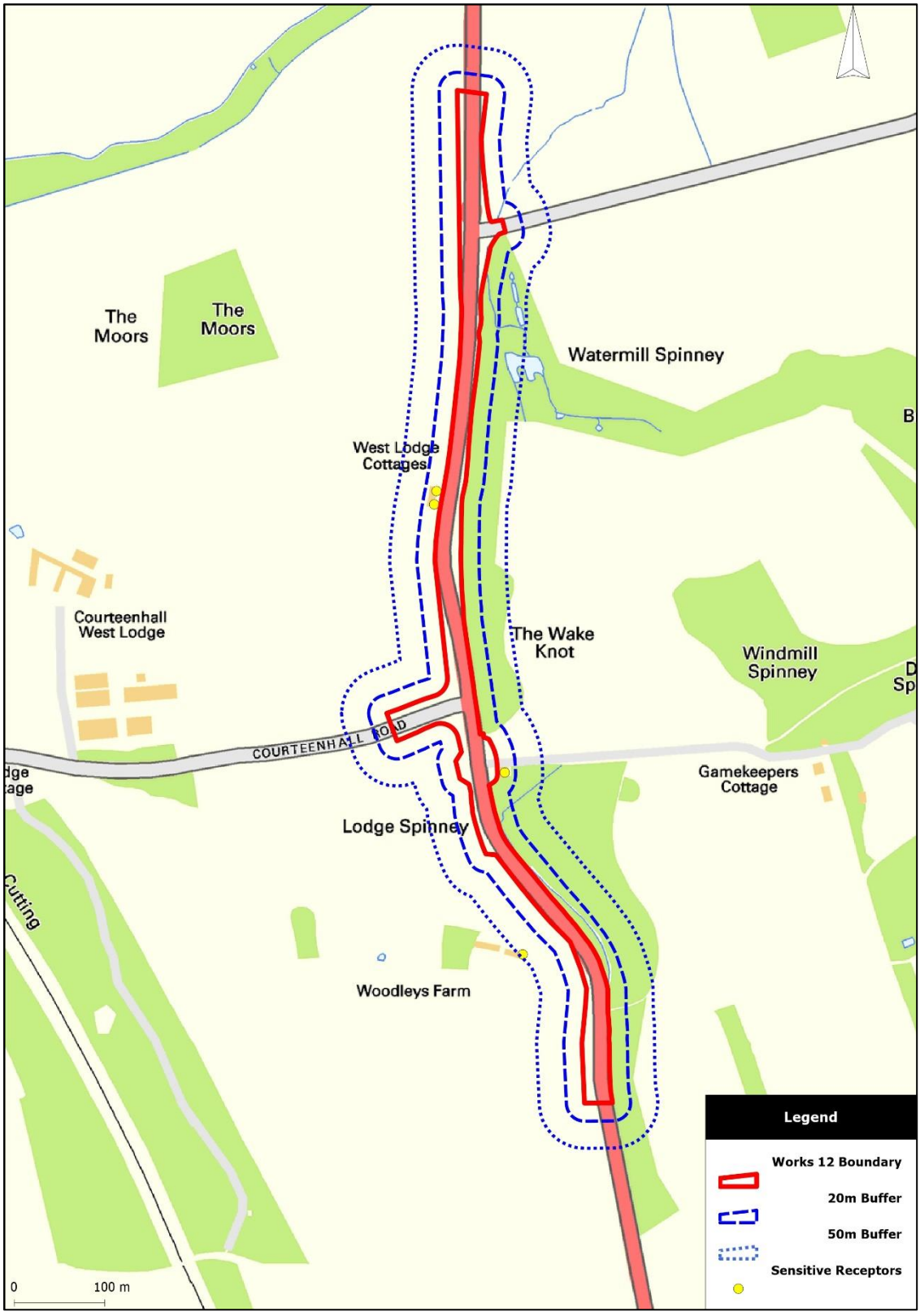

Figure 11. Rookery Lane / Ashton Road junction improvement (Works No. 14)

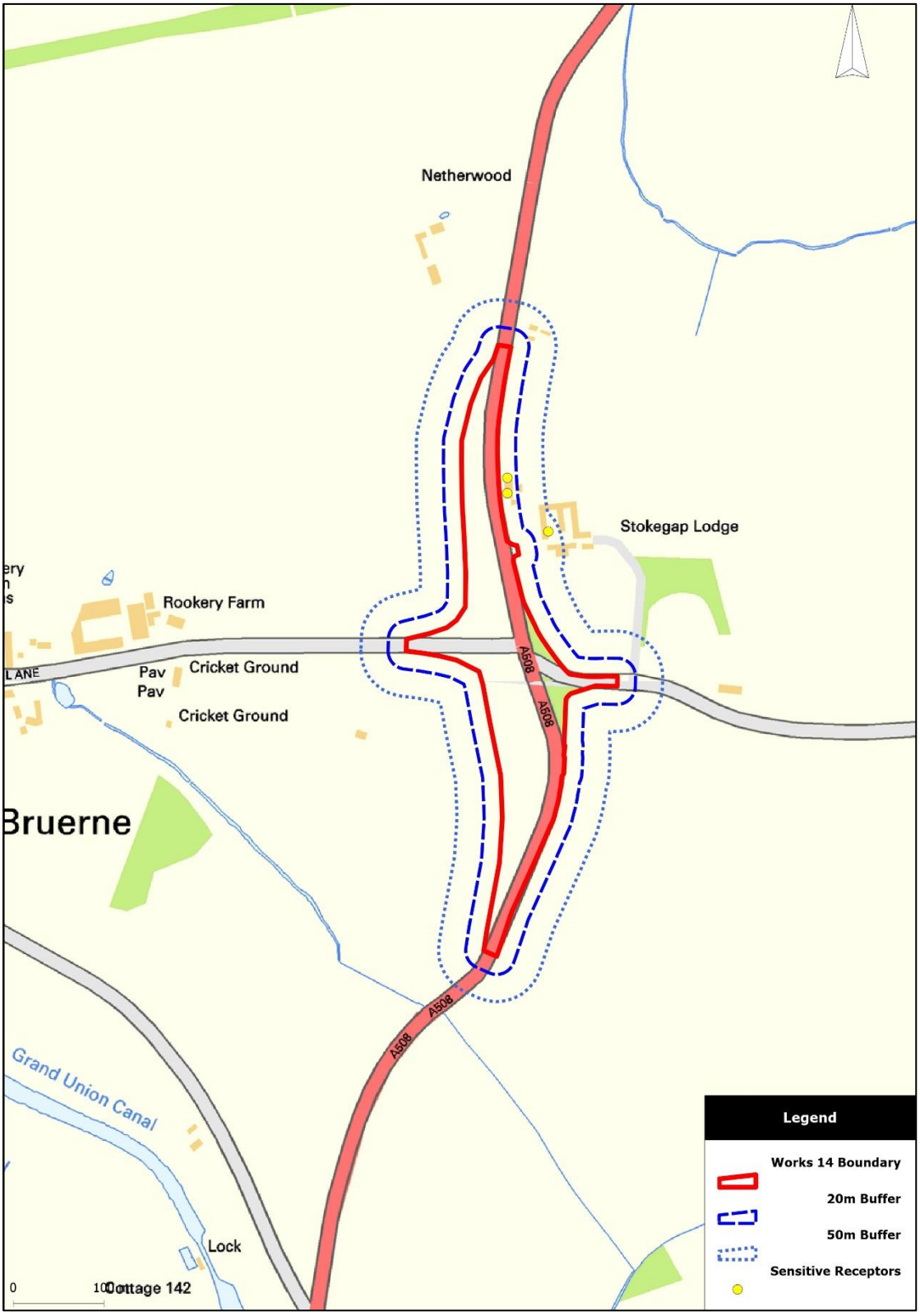

Figure 12. Pury Road junction improvement (Works No. 15)

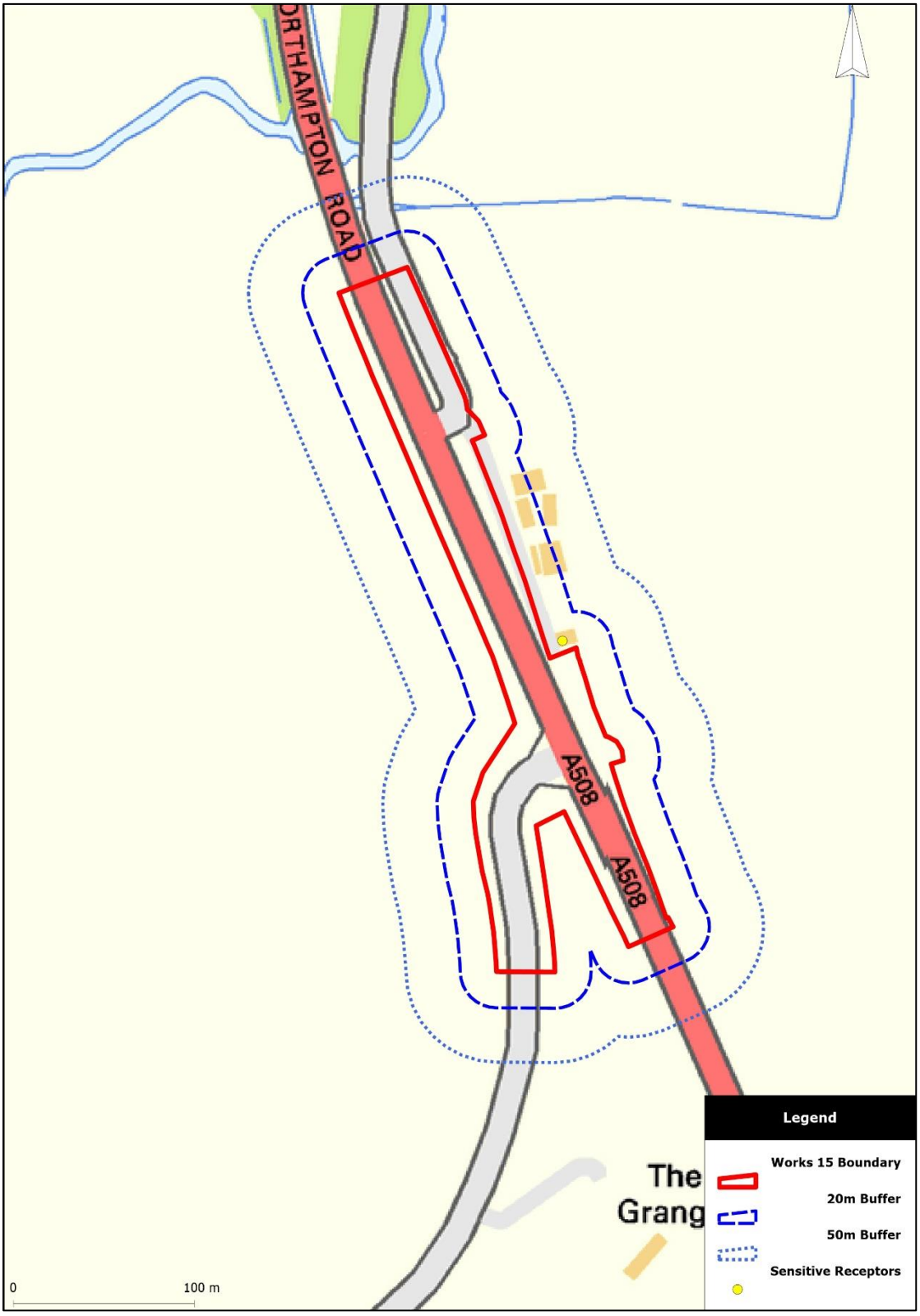

Figure 13. Knock Lane / Stoke Road junction improvement (Works No. 16a)

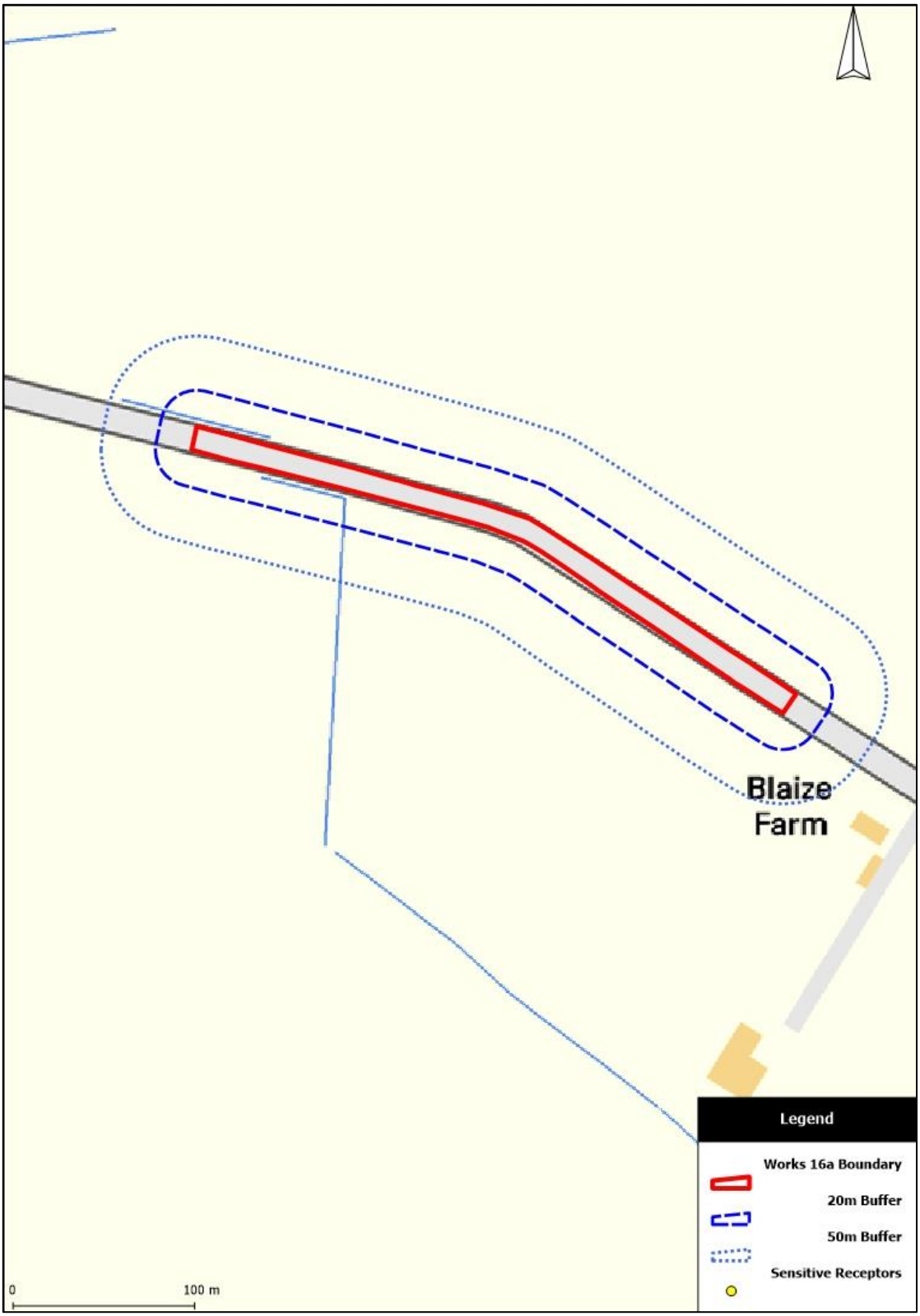

Figure 14. Knock Lane / Stoke Road junction improvement (Works No. 16b)

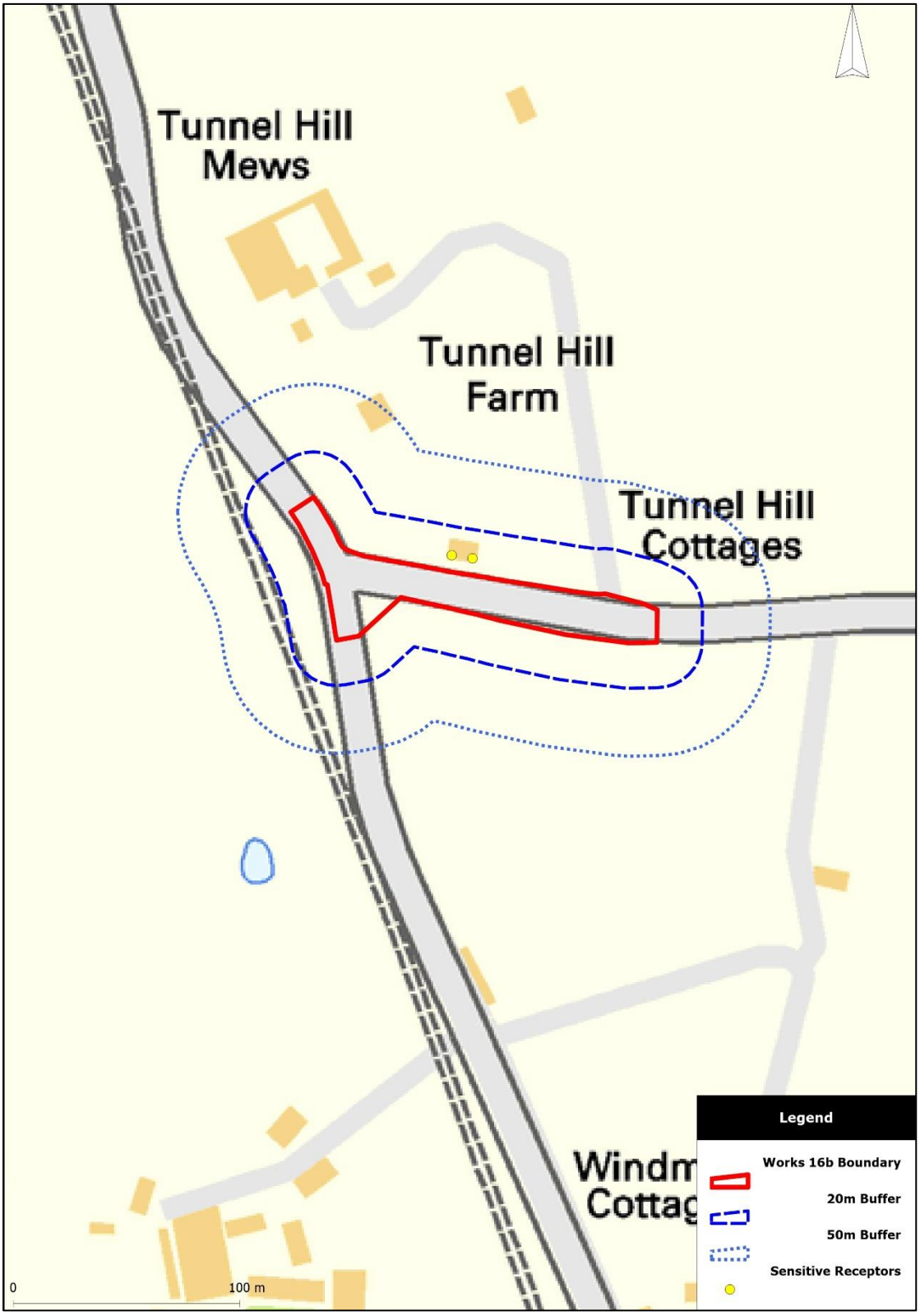

Figure 15. A508 at Grafton Regis/Church Lane junction improvement (Works No. 17)

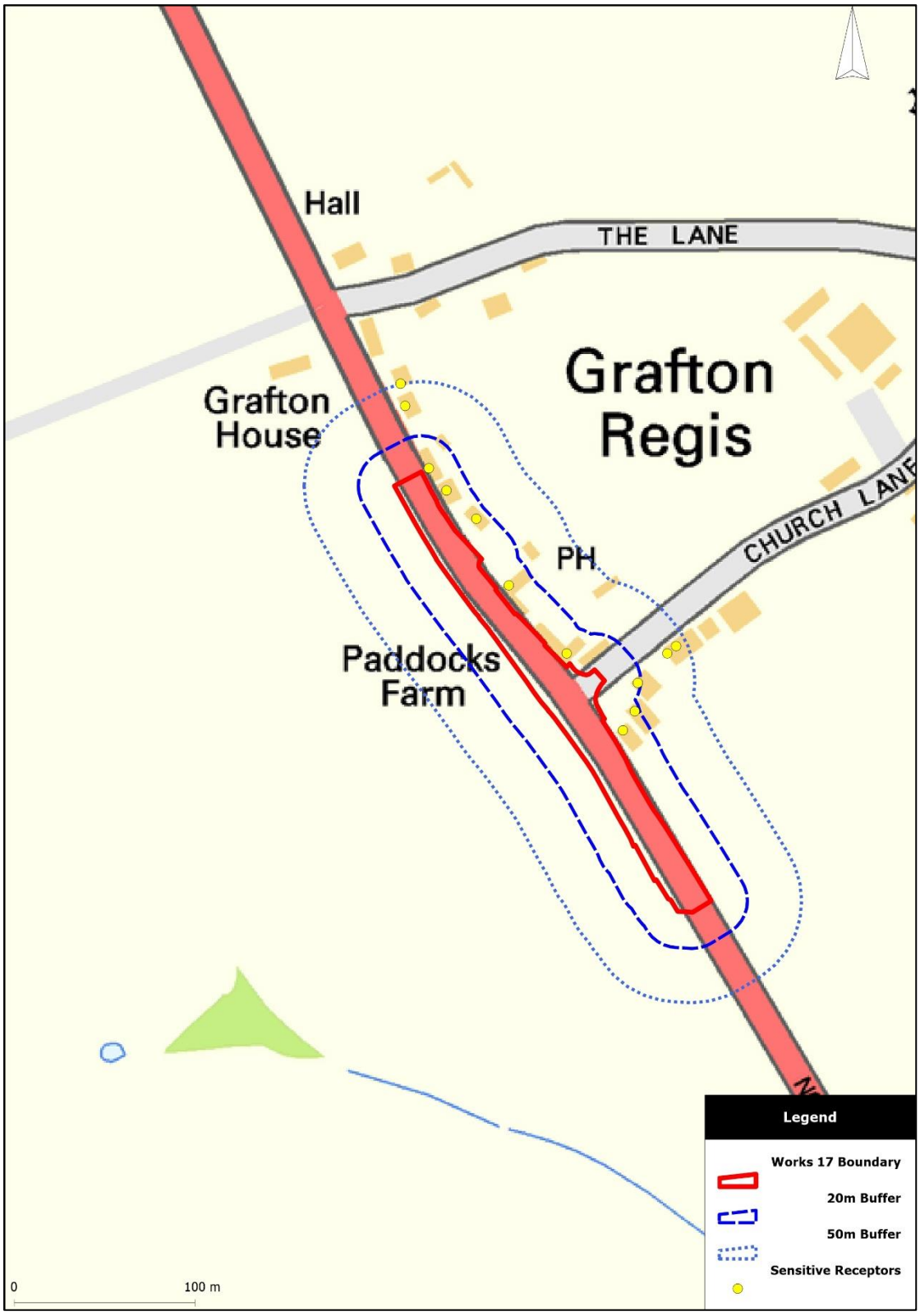

Figure 16. Main Site Bulk Earthworks

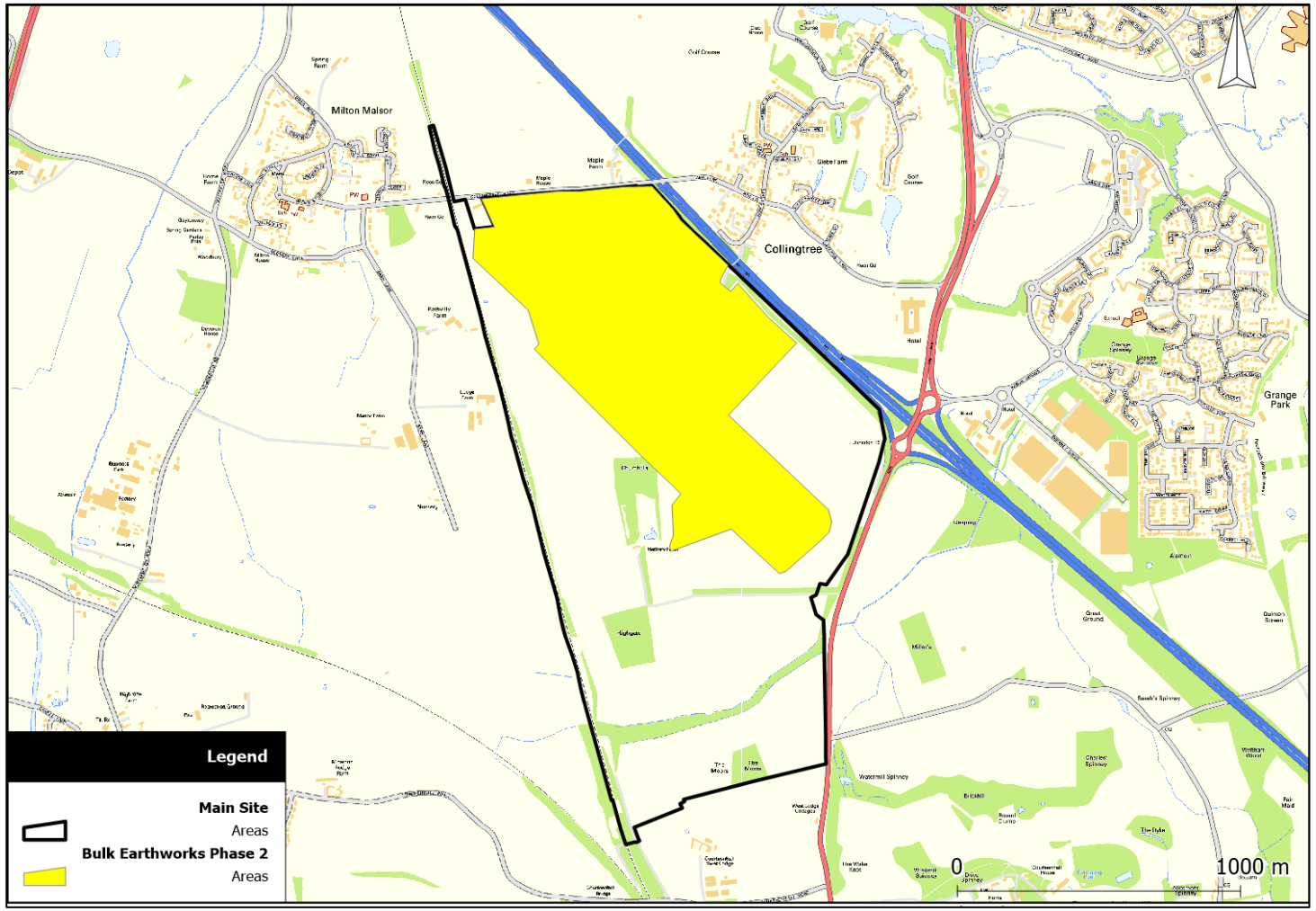

Figure 17. Main Site Construction Zones

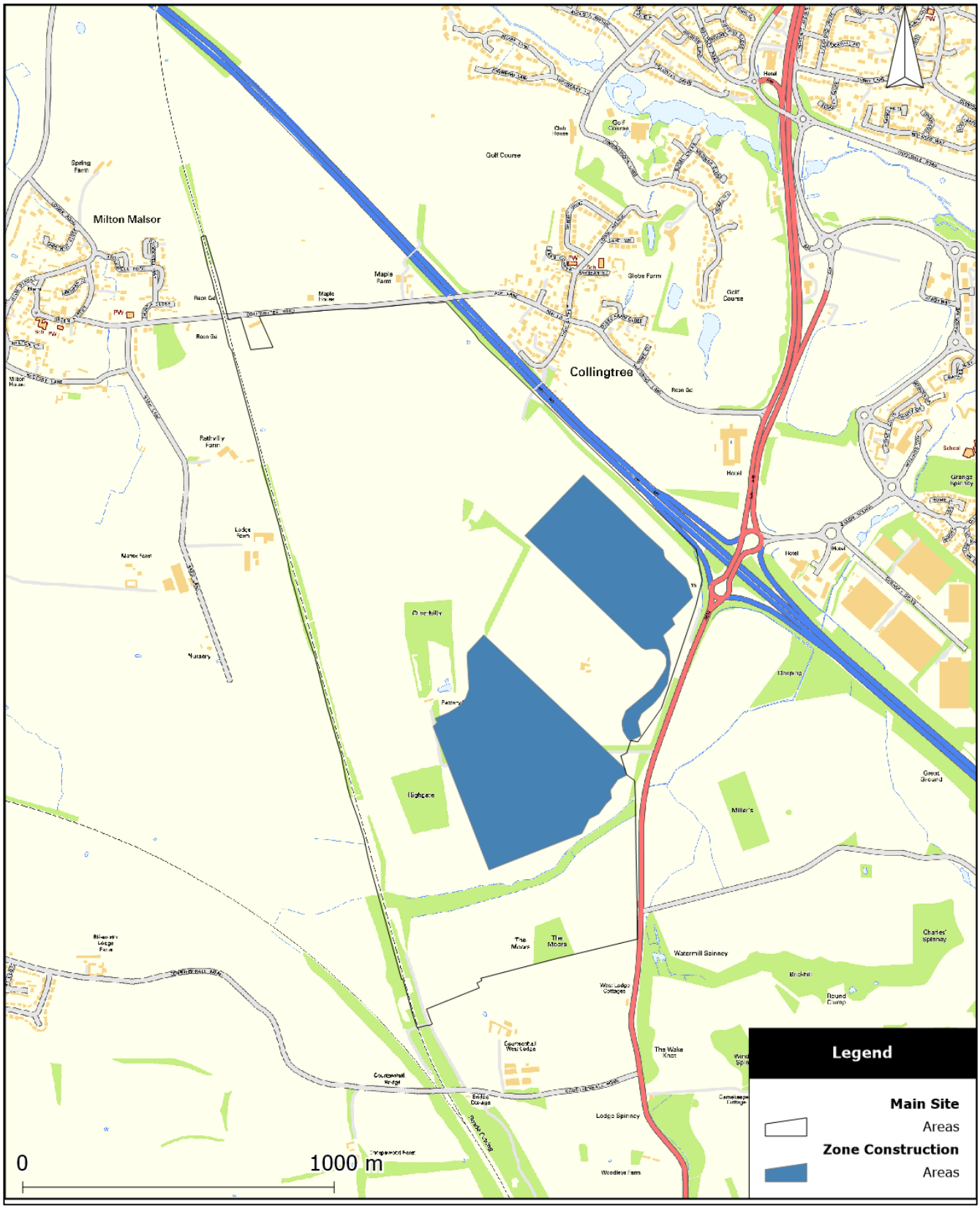

Figure 18. Main Site J15 improvements, Rail Terminal and Infrastructure, Phased Roads and Haul Road works areas.