SHERFORD

Report to Inform an Appropriate Assessment

as defined by Regulation 48 of The Conservation (Natural Habitats, &c.) Regulations 1994

NOVEMBER 2006

FOREWORD

Red Tree (2004) LLP has submitted a planning application for 'Sherford' to both South Hams District Council and Plymouth City Council.

The application is in two parts as follows

Outline for:

- up to 5,500 new dwellings;
- up to 67,000 square metres of business and commercial space;
- up to 16,740 square metres of mixed retail accommodation;
- community, sports and open space facilities, including a Community Park;
- three primary schools and one secondary school;
- one health centre;
- two community wind turbines; and
- a Park and Ride interchange at Deep Lane junction.

Detail for:

- the Main Street link between Deep Lane junction and Stanborough Cross.

The application comprises the following documents (the document you are currently reading is in bold):

- Masterplan Book
- Town Code
- Transport Assessment
- Retail Impact Assessment
- Environmental Statement
- Environmental Statement Non-Technical Summary
- **Report to Inform an Appropriate Assessment**
- Flood Risk Assessment
- Section 106 Agreement: Draft Heads of Terms
- Main Street: Deep Lane Junction to Stanborough Cross

The entire planning application and any supporting documents can be viewed at www.redtreellp.com

If you would like to formally comment on the planning application, please contact the determining authorities – South Hams District Council and/or Plymouth City Council.

If you require any further details, please contact either of the following:

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DARTMOOR SAC

Part of Dartmoor National Park is designated as a Special Area of Conservation (SAC) under the EU Habitats Directive.

This Directive is enacted into UK law by the Conservation (Natural Habitats &c.) Regulations 1994. Regulation 48 of The Regulations requires that the relevant 'competent authority', before deciding to undertake, or give consent for, a project that is likely to have a significant effect on a European site in the United Kingdom, must carry out an 'appropriate assessment' of how impacts upon that site's integrity, structure and function will translate into effects on the favourable conservation status of the interest features for which the site was designated.

In this case the competent authorities are Plymouth City Council & South Hams District Council. It is the responsibility of the party applying for consent to provide the 'competent authority' with any information that they may reasonably require for the purposes of the assessment. The competent authority will usually make the assessment in consultation with Natural England.

Scott Wilson were commissioned by Red Tree LLP to provide the information required by the competent authorities/Natural England to make an appropriate assessment under Regulation 48 of the Conservation (Natural Habitats &c.) Regulations 1994 concerning the effects of the Sherford development upon Dartmoor SAC. This report was produced in consultation with Natural England.

Part 1: Description of project and Natura 2000 site	
Brief Description of Project or Plan	Construction of a new community of up to 5,500 units and associated landscaping on approx. 400 ha of farmland south of the A38 at Sherford, immediately east of Elburton, Plymouth.
Brief Description of Natura 2000 Site (including code number)	Dartmoor SAC (UK0012929) covers more than 23,000 ha of Devon and is situated approx. 10 km northeast of Sherford. Approximately 80% of this area is upland heath and blanket bog. The site also includes small areas of acid and agriculturally improved grassland, broad-leaved deciduous woodland and rocks/scree. The following habitats and species are cited as the primary reason for selection of the site as an SAC: • 4010 Northern Atlantic wet heaths. This is representative of the upland wet heath in south-west England and, with patches of drier areas of heathland, forms a mosaic of vegetation types not fully represented elsewhere; • 4030 European dry heaths. The site is notable as it contains extensive areas of H4 *Ulex galii – Agrostis curtisii* heath, which is more usually found in the lowlands; • 7130 Blanket bog. Dartmoor is the southern-most blanket bog in Europe. Of particular note is the rare *Sphagnum imbricatum*, which occurs at two localities; • 91A0 Old sessile oak woods. There are three main areas of oak wood within this site – Wistman's Wood,

	Dendles Wood and Black Tor Copse. The bryophyte and lichen assemblages are very rich including nationally rare species and others seldom found outside Scotland and Wales; and • 1044 Southern damselfly *Coenagrion mercuriale*. A part of the SAC supports a population of 20 – 100 southern damselfies. • The following species are qualifying features for designation as an SAC, but were not a primary reason for site selection: Atlantic salmon *Salmo salar* and otter *Lutra lutra*.
Set out the conservation objectives of the site	One of the key nature conservation objectives for Dartmoor is to reverse the degradation of blanket bog and wet heath by providing stable conditions that favour bog vegetation. To maintain the favourable condition of the old sessile oak woods and the population of Southern damselfly.
List of references and organisations consulted during the assessment	Colin Powlesland, Environment Agency Air Quality Policy Manager Conservation (Natural Habitats &c) Regulations 1994 Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992 Dartmoor SAC Natura 2000 Standard Data Form. JNCC, Peterborough Department of Transport. 2005. Interim Advice Note (IAN) 61/05. Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature Conservation Sites and SSSI's (Supplement to DMRB 11.3.1). HMSO, London. Dore CJ et al. 2005. UK Emissions of Air Pollutants 1970 – 2003. UK National Atmospheric Emissions Inventory. http://www.airquality.co.uk/archive/index.php English Nature Exeter Office Environmental Statement for Langage Energy Park, 2004 UK Air Pollution Information System. www.apis.ac.uk
Part 2: Description of impacts and effects of project on Natura 2000 site	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site	The development of up to 5,500 new homes at Sherford between 2008 and 2019 (along with associated infrastructure and increased vehicle use) can be expected to lead to an increase in atmospheric pollutants both due to this development alone and cumulatively with other developments in the southwest.
Describe any possible	**Air Quality**

direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the integrity, structure and function of the Natura 2000 site.

The main ecologically relevant atmospheric pollutants associated with housing developments are oxides of nitrogen.

Oxides of nitrogen (NOx) are formed during high temperature combustion processes from the oxidation of nitrogen in the air. The principal source of oxides of nitrogen is road traffic, which is responsible for approximately half of all emissions. In contrast, domestic and commercial sources (coal fires, home heaters and gas cookers for example) are responsible for only 4% of all NOx emissions[1]. Within a 'typical' housing development, by far the largest contribution to NOx (92%) will be made by the associated road traffic. Other sources, although relevant, are of minor importance (8%) in comparison.

NOx concentrations are therefore greatest in urban areas where traffic is heaviest and are likely to increase as a result of increases in traffic associated with the Sherford development. An increase in the deposition of nitrogen from the atmosphere to soils is generally regarded to lead to an increase in soil fertility, which can have a serious deleterious effect on the quality of semi-natural, nitrogen-limited terrestrial habitats. This could potentially have a serious deleterious effect on the habitats for which Dartmoor SAC and Plymouth Sound & Estuaries SAC were designated, and upon the habitats that support the birds for which the Tamar Estuaries Complex SPA was designated.

The rate of atmospheric nitrogen deposition at which the key habitats at Dartmoor SAC and Plymouth Sound & Estuaries SAC will be deleteriously affected are shown in Table 1.

Table 1. Calculated minimum critical loads[2] of nitrogen deposition (in $kg/Nha^{-1}yr^{-1}$) for the three habitats for which Dartmoor was designated as an SAC.

Upland heathland	Raised bog and blanket bog	Oak woodland[3]
10	30	10

A NOx level in excess of 30 $\propto gm^{-3}$ (the World Health Organisation critical level for the protection of vegetation as detailed within the Air Quality Limit Value Regulations 2001) or a nitrogen load in excess of 10 $kg/Nha^{-1}yr^{-1}$ (the minimum load below which there should be no significant harmful effects on the main Dartmoor habitats - upland heathland, oak woodland and blanket bog) can be

[1] Dore et al. 2005

[2] Taken from the UK Air Pollution Information System. Critical loads are given as ranges – on a precautionary basis the critical load used here is the minimum figure in the range.

[3] Several critical loads are given, relating to each component of the habitat (ground vegetation, soil processes, trees, mycorrhiza, lichens and algae); the lowest critical load is given above.

	assumed to have a deleterious effect on at least some of the principal interest features of the Dartmoor SAC. **Abstraction of freshwater** The Sherford development will clearly have extensive freshwater supply requirements, which will be met by South West Water.

Part 3. Determination of significance

Determine the significance of these impacts. Acknowledge uncertainties and any gaps in information

Air quality

Tables 10.2 and 10.3 show the annual mean NOx and nitrogen deposition at the closest point of Dartmoor SAC (NGR 264055, 061055) for various years, calculated using the projected changes in traffic flows in and around the Sherford as a result of the development.

Table 10.2. Annual Mean NOx Concentration at Dartmoor SAC

	Scenario	NOx (µg/m^3)	NO_2 (µg/m^3)
1	2005 baseline	5.22	5.20
2	2016[4]	4.25	4.24
3	2016, with Sherford operational	4.25	4.24
	Difference between scenarios 2 and 3	**<0.01**	**<0.01**

The annual mean NO_2 concentration predicted at the SAC is well below the EU limit value / Air Quality Strategy objective of 30 µg/m^3, and the change of <0.01 µg/m^3 is well below the 2 µg/m^3 level for concern as stated in Department of Transport (2005).

Table 10.3. Annual Mean rate of Nitrogen Deposition at Dartmoor SAC, for the three habitats that most typify the site

		Deposition (kg N ha/yr)		
	Scenario	**Upland Heathland**	**Raised Bog and Blanket Bog**	**Oakland Woodland**
1	2005 baseline	15.71	15.71	27.82
2	2016	12.58	12.58	22.28
3	2016, with Sherford operational	12.58	12.58	22.28
	Difference between scenarios 2 and 3	**<0.01**	**<0.01**	**<0.01**

The nitrogen load for the part of Dartmoor SAC closest to Sherford is already well in excess of the minimum critical

[4] This baseline includes road traffic emissions associated with other permitted developments, but excludes Sherford.

loads for the most sensitive habitats (oak woodland and upland heathland), but the additional contribution due to Sherford is negligible.

'In Combination' Effects

The Sherford development will inevitably add cumulatively to overall NOx levels over Dartmoor SAC, but it is necessary to determine whether this cumulative increase will have a significant adverse effect.

This is best done by assessing the effects of Sherford in combination with the construction of a new power station at Langage Energy Park, since this project has the greatest potential for an adverse effect on air quality within the Plymouth area, dwarfing that of all other developments[5]. It is therefore necessary to determine whether the Sherford development combined with both the predicted 2016 traffic levels *and* the Langage Energy Park would result in a rate of nitrogen deposition that is greater than that which has been determined to have a deleterious effect upon key habitats within each of the three European sites.

Table 10.16. Annual Mean rate of Nitrogen Deposition at Plymouth Sound & Estuaries SAC, for the only habitat for which critical loads have been determined, when Langage Power Station is taken into consideration.

	Scenario	Deposition (kg N ha/yr)
1	2005 baseline	14.14
2	2016 without Langage Energy Park	11.33
3	2016 with Langage Energy Park in operation	11.36
4	2016 with both Langage Energy Park and Sherford operational	11.36
	Difference between scenario 3 and scenario 4	**<0.01**

It has been established in a previous section that, in 2016, the sensitive habitats at Dartmoor SAC will already be subject to a rate of nitrogen deposition that is greater than the critical load even without Sherford and Langage. The Environment Agency use a value of 1% of the environmental criteria[6] to screen out developments whose contribution to atmospheric pollution is so small as not to require further consideration[7]. In this case that would mean that any development that would increase the rate of nitrogen deposition at Dartmoor by less than 0.1 kgN ha/yr

[5] Increases in road traffic associated with existing permitted developments are already factored into the 2016 baseline

[6] Dr. Colin Powlesland, Environment Agency Air Quality Policy Manager, personal communication

[7] However, this does not necessarily mean that a development that makes a contribution of more than 1% of the relevant environmental criterion will have an adverse impact, but rather that such a development cannot be screened out and would require further investigation.

[8] As defined by Regulation 48 of the Conservation (Natural Habitats &c) Regulations 1994.

[9] Note that the Environment Agency Review of Consents process assesses the impact of the consented maximum level of abstraction, even if the current actual level of abstraction is lower.

	(1% of the critical load for oak woodland, the most sensitive habitat for which Dartmoor SAC was designated) can be ruled out as making a negligible contribution to the overall nitrogen load. Since the increase in nitrogen deposition at Plymouth Sound & Estuaries will be 0.03 kgN ha/yr as a result of Sherford and Langage combined, it can be reasonably assumed that the increase at Dartmoor will be even lower due to the greater distance. This is considerably less than the 0.1 kgN ha/yr screening threshold and can therefore be considered a negligible contribution. **Other atmospheric pollutants** While sulphur dioxide (SO_2) is a significant contributor to acidification of habitats (leading to substantial changes in botanical composition over time), emissions are overwhelmingly influenced (82% of all emissions) by the output of power stations and industrial combustion processes, none of which will be associated with Sherford. In contrast, road traffic and domestic boilers are responsible for only 5% of all emissions. The increase in sulphur dioxide emissions due to the Sherford development will therefore be negligible. Low-level ozone (O_3) is unlike the other pollutants, in that it is not emitted directly into the atmosphere, but is a secondary pollutant produced by a complex reaction between nitrogen dioxide (NO_2), hydrocarbons and sunlight. Unlike the other pollutants, it cannot therefore be directly related to increases in housing, traffic etc. Moreover, the physical range of this pollutant is sufficiently great that the source of emission and location of deposition can cross national boundaries. As such, low-level ozone can only be practically addressed at the national and international level and cannot be assessed within this chapter. **Water abstraction** South West Water is currently developing its detailed strategy for future clean water distribution. However, the Company has confirmed that the supply for Sherford will be provided from the Crown Hill Water Treatment Works through the water mains network to the reservoir at Roborough, which subsequently feeds the reservoir at Houndall. A new water main will have to be constructed by South West Water to connect the site to the existing network. South West Water has confirmed that it will not be applying for any new abstraction licences relating to Sherford and will be able to supply site through existing licence arrangements. As part of the Review of Consents process, the Environment Agency is carrying out an Appropriate Assessment[8] of the effects of all licenced abstractions on Dartmoor SAC and other European sites[9]. Where it cannot

	be concluded that an existing abstraction licence is not having an adverse effect on any European site, the Environment Agency will require adjustment of the terms of the licence or other mitigation measures to be put in place that will negate the effect. Given these controls and based on the information available to date, the Sherford development will have a negligible impact on European sites due to freshwater abstraction, leading to an effect that is not significant.

Part 4: Mitigation measures			
Describe what mitigation measures are to be introduced to avoid, reduce or remedy any significant adverse effects on the integrity, structure and function of the Natura 2000 site.			
List measures to be introduced	*Explain how the measures will avoid the adverse effects on the integrity of the site*	*Explain how the measures will reduce adverse effects on the integrity of the site*	*Provide evidence of how they will be implemented and by whom*
	None required		
Assessment of significant residual adverse impacts		**None**	
Assessment of alternative solutions where significant residual impacts remain		**Not Applicable**	

APPENDIX: AIR QUALITY ASSESSMENT METHODOLOGY

The assessment follows the procedure set out in the Design Manual for Roads and Bridges Interim Advice Note 61/05 for undertaking environmental assessment of air quality for sensitive ecosystems in internationally designated nature conservation sites and SSSIs. As the DMRB screening method is not appropriate for the scheme being assessed, pollutant concentration values have been obtained through the use of detailed dispersion models instead.

ADMS roads has been used to calculate the annual mean concentration of NOx at each receptor, due to road traffic emissions associated with the Sherford development and for baseline road traffic emissions.

Predicted contributions, to the total annual mean concentrations of NOx at receptors derived, from direct emissions of NOx from the Langage energy facility have been taken from the Environmental Statement for that proposal. The impact of Langage energy facility has not been re-modelled as part of this assessment.

In order to calculate in combination effects of NOx from predicted 2016 baseline road traffic emissions, emissions from Langage energy facility, road traffic emissions associated with the operation of Sherford and ambient background levels of NOx, contributions from all these sources have been included in the quantitative assessment. The method set out in IAN 61/05 has been adapted such that the contribution from Langage has been added to the road traffic contribution at the appropriate point in the assessment procedure.

Summary of Dispersion Model Input Data

CERC's dispersion model software 'ADMS Roads' is derived from 'ADMS Urban' and both of these models have an extensive published track record of use in the UK, for the assessment of local air quality impacts, including model validation and verification studies (CERC, 2006).

The general model conditions used in the assessment are summarised in the table below. Other more detailed aspects needed to model the dispersion of emissions are considered below.

Table: General ADMS Roads Model Conditions

Variable	Input
Surface roughness at source	0.5 m
Monin-Obukhov length	30 m
Receptor location	x,y coordinate as in Table 1, z = 0 m
Source location	x,y coordinates determined by GIS
Emissions	NOx
Emissions inventory	DMRB 2003
Sources	LDV, HDV as peak pm flow (veh/hr) based on data used in the transport assessment.
Background pollutant concentrations	None, value from National Air Quality Information Archive added manually
Meteorological data	1 year of hourly sequential data from Meteorological Station in Plymouth
Diurnal emissions profile	Hourly data file, fraction of peak flow. Same profile for all days of week.

Model output	Annual mean concentration of NOx ($\mu g/m^3$) at receptors

Traffic Data

Traffic data for use in this assessment are derived from the data presented in the Transport Assessment for the development. This includes data for all other developments that have been considered within the transport assessment as potentially contributing to traffic volumes on roads in the study area over the study period.

ADMS Roads is able to apply a single source strength profile to each model scenario, to reflect changes in traffic flow rates during the day. The traffic assessment produced two diurnal profiles, one for the A38 and another for local roads on a weekday basis. This approach is likely to over predict traffic exhaust emissions on Sundays and during the school holidays and as such is likely to result in a robust assessment of impacts.

Meteorological Data

One year (2004) of hourly sequential data was used in this study. It is derived from meteorological measurements taken in Plymouth. This data was prepared by the MET Office as being the most representative set of meteorological data available for the development site. This data represents the full range of meteorological conditions that where experienced in the study area during 2004 and as such the annual mean pollutant concentration predicted by the model represents the annual mean concentration of NOx that receptors would be exposed to over the whole year.

PLYMOUTH SOUND & ESTUARIES SAC

Plymouth Sound & Estuaries is designated as a Special Area of Conservation (SAC) under the EU Habitats Directive.

This Directive is enacted into UK law by the Conservation (Natural Habitats &c.) Regulations 1994. Regulation 48 of The Regulations requires that the relevant 'competent authority', before deciding to undertake, or give consent for, a project that is likely to have a significant effect on a European site in the United Kingdom, must carry out an 'appropriate assessment' of how impacts upon that site's integrity, structure and function will translate into effects on the favourable conservation status of the interest features for which the site was designated.

In this case the competent authorities are Plymouth City Council & South Hams District Council. It is the responsibility of the party applying for consent to provide the 'competent authority' with any information that they may reasonably require for the purposes of the assessment. The competent authority will usually make the assessment in consultation with Natural England.

Scott Wilson were commissioned by Red Tree LLP to provide the information required by the competent authorities/Natural England to make an appropriate assessment under Regulation 48 of the Conservation (Natural Habitats &c.) Regulations 1994 concerning the effects of the Sherford development upon Plymouth Sound & Estuaries SAC. This report was produced in consultation with Natural England.

Part 1: Description of project and Natura 2000 site	
Brief Description of Project or Plan	Construction of a new community of up to 5,500 units and associated landscaping on approx. 400 ha of farmland south of the A38 at Sherford, immediately east of Elburton, Plymouth.
Brief Description of Natura 2000 Site (including code number)	Plymouth Sound and Estuaries SAC (UK0013111) incorporates part of the Yealm Estuary SSSI and is located approximately 6 km downstream of the development site. It covers more than 6,000 ha of coastline, ria (a submergent coastal landform or "drowned river valley"), estuary and open sea in Cornwall and Devon. The Annexe I habitats and Annexe II species that are the primary reason for the selection of the site are: 1110 Sandbanks which are slightly covered by sea water all the time 1130 Estuaries 1160 Large shallow inlets and bays 1170 Reefs 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1441 Shore dock *Rumex rupestris* The Annexe I habitats and Annexe II species present as a qualifying feature, but not a primary reason for selection of the site are:

	1140 Mudflats and sandflats not covered by seawater at low tide 1102 Allis shad *Alosa alosa*
List of references and organisations consulted during the assessment	Colin Powlesland, Environment Agency Air Quality Policy Manager Conservation (Natural Habitats &c) Regulations 1994 Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992 Department of Transport. 2005. Interim Advice Note (IAN) 61/05. Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature Conservation Sites and SSSI's (Supplement to DMRB 11.3.1). HMSO, London. Dore CJ et al. 2005. UK Emissions of Air Pollutants 1970 – 2003. UK National Atmospheric Emissions Inventory. http://www.airquality.co.uk/archive/index.php English Nature Exeter Office Environmental Statement for Langage Energy Park, 2004 Langston, W.J., Chesman, B.S., Burt, G.R., Hawkins, S.J., Readman, J., Worsfold, P. 2003. Occasional Publication No. 14: Characterisation of the Southwest European Marine Sites – Summary Report. Marine Biological Association, Plymouth. Plymouth Sound and Estuaries SAC Natura 2000 Standard Data Form. JNCC, Peterborough. UK Air Pollution Information System. www.apis.ac.uk
Part 2: Description of impacts and effects of project on Natura 2000 site	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site	The development of up to 5,500 new homes at Sherford between 2008 and 2019 (along with associated infrastructure and increased vehicle use) can be expected to lead to an increase in atmospheric pollutants both due to this development alone and cumulatively with other developments in the southwest. In addition, without special consideration there is a risk that surface water discharges from the development into the streams on site could alter the flow and water quality of the River Yealm leading into the SAC.
Describe any possible direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on	Air Quality The main ecologically relevant atmospheric pollutants associated with housing developments are oxides of nitrogen. Oxides of nitrogen (NOx) are formed during high temperature combustion processes from the oxidation of

the integrity, structure and function of the Natura 2000 site.	nitrogen in the air. The principal source of oxides of nitrogen is road traffic, which is responsible for approximately half of all emissions. In contrast, domestic and commercial sources (coal fires, home heaters and gas cookers for example) are responsible for only 4% of all NOx emissions[1]. Within a 'typical' housing development, by far the largest contribution to NOx (92%) will be made by the associated road traffic. Other sources, although relevant, are of minor importance (8%) in comparison. NOx concentrations are therefore greatest in urban areas where traffic is heaviest and are likely to increase as a result of increases in traffic associated with the Sherford development. An increase in the deposition of nitrogen from the atmosphere to soils is generally regarded to lead to an increase in soil fertility, which can have a serious deleterious effect on the quality of semi-natural, nitrogen-limited terrestrial habitats. This could potentially have a serious deleterious effect on the habitats for which Plymouth Sound & Estuaries SAC was designated. The calculated minimum critical loads[2] of nitrogen deposition (in $kg/Nha^{-1}yr^{-1}$) for the only habitat within Plymouth Sound & Estuaries and Tamar Estuaries Complex for which critical loads have been calculated[3] is 30 $kg/Nha^{-1}yr^{-1}$ Therefore, a NOx level in excess of 30 $\propto gm^{-3}$ (the World Health Organisation critical level for the protection of vegetation as detailed within the Air Quality Limit Value Regulations 2001) or a nitrogen load in excess of 30 $kg/Nha^{-1}yr^{-1}$ (the minimum load below which there should be no significant harmful effects on the saltmarsh within the SAC) can be assumed to have a deleterious effect on at least some of the principal interest features of the Plymouth Sound & Estuaries SAC. <u>Introduction of non-native species</u> There is a single stream (the Sherford Stream) that lies south of the development and ultimately forms a tributary of the River Yealm, which in turn drains into Plymouth Sound & Estuaries SAC. Due to the presence of residential properties near the streams, there is a small risk of introducing invasive non-native species such as floating pennywort *Hydrocotyle ranunculoides*, water fern *Azolla filiculoides* and Australian swamp stonecrop *Crassula helmsii*, which may migrate to the River Yealm.

[1] Dore et al. 2005

[2] Taken from the UK Air Pollution Information System. Critical loads are given as ranges – on a precautionary basis the critical load used here is the minimum figure in the range.

[3] Critical loads have not been determined for rivers and marine habitats, but a figure is available for saltmarsh

<table>
<tr><td></td><td>
<u>Discharge of treated sewage effluent</u>
It development of Sherford will increase the quantity of wastewater requiring treatment by South West Water. If this water is discharged into the Plymouth Sound & Estuaries SAC, or any of the rivers that drain into the estuary, there is a risk that the increased volume of wastewater entering the estuary will lead to eutrophication.

<u>Surface water runoff</u>
Runoff from the development could increase flows in the Yealm, thereby leading to increased erosion while pollutants contained in runoff could adversely affect the water quality.
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<tr><td colspan="2">Part 3. Determination of significance</td></tr>
<tr><td>Determine the significance of these impacts. Acknowledge uncertainties and any gaps in information</td><td>
<u>Air Quality</u>
Tables 10.1 and 10.2 show the annual mean NOx and nitrogen deposition at the closest point of Plymouth Sound & Estuaries SAC (NGR 254110, 051623) for various years, calculated using the projected changes in traffic flows in and around the Sherford as a result of the development.

Table 10.1. Annual Mean NOx Concentration at Plymouth Sound & Estuaries SAC
<table>
<tr><th></th><th>Scenario</th><th>NOx (µg/m^3)</th><th>NO_2 (µg/m^3)</th></tr>
<tr><td>1</td><td>2005 baseline</td><td>7.71</td><td>7.60</td></tr>
<tr><td>2</td><td>2016</td><td>6.25</td><td>6.19</td></tr>
<tr><td>3</td><td>2016, with Sherford operational</td><td>6.30</td><td>6.21</td></tr>
<tr><td></td><td>Difference between scenarios 2 and 3</td><td>0.05</td><td>0.02</td></tr>
</table>
The annual mean NO_2 value predicted at the SAC is well below the EU limit value / Air Quality Strategy objective of 30 µg/m^3, and the change of 0.02 µg/m^3 is well below the 2 µg/m^3 level for concern as stated in the Department of Transport (2005).

Table 10.2. Annual Mean rate of Nitrogen Deposition at Plymouth Sound & Estuaries SAC, for the only habitat for which critical loads have been determined
<table>
<tr><th></th><th>Scenario</th><th>Deposition (kg N ha/yr)</th></tr>
<tr><td>1</td><td>2005 baseline</td><td>14.14</td></tr>
<tr><td>2</td><td>2016</td><td>11.33</td></tr>
<tr><td>3</td><td>2016, with Sherford operational</td><td>11.33</td></tr>
<tr><td></td><td>Difference between scenarios 2 and 3</td><td><0.01</td></tr>
</table>
The nitrogen load for Plymouth Sound and Estuaries SAC closest to Sherford is well below the minimum critical load and the additional contribution due to Sherford is negligible.
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The impact of changes in air quality on Plymouth Sound & Estuaries SAC due to Sherford is therefore considered negligible leading to an effect that is not significant.

'In Combination' Effects

The Sherford development will inevitably add cumulatively to overall NOx levels over Plymouth Sound & Estuaries SAC, but it is necessary to determine whether this cumulative increase will have a significant adverse effect.

This is best done by assessing the effects of Sherford in combination with the construction of a new power station at Langage Energy Park, since this project has the greatest potential for an adverse effect on air quality within the Plymouth area, dwarfing that of all other developments (increases in road traffic associated with existing permitted developments is already factored into the 2016 baseline). It is therefore necessary to determine whether the Sherford development combined with both the predicted 2016 traffic levels *and* the Langage Energy Park would result in a rate of nitrogen deposition that is greater than that which has been determined to have a deleterious effect upon key habitats within the European site.

Table 10.3. Annual Mean rate of Nitrogen Deposition at Plymouth Sound & Estuaries SAC, for the only habitat for which critical loads have been determined, when Langage Power Station is taken into consideration.

	Scenario	Deposition (kg N ha/yr)
1	2005 baseline	14.14
2	2016 without Langage Energy Park	11.33
3	2016 with Langage Energy Park in operation	11.36
4	2016 with both Langage Energy Park and Sherford operational	11.36
	Difference between scenario 3 and scenario 4	<0.01

Table 10.3 shows that the Sherford development will make a negligible contribution of less than 0.01 kgN ha/yr to nitrogen deposition at Plymouth Sound & Estuaries SAC, and that even when considered cumulatively with Langage Energy Park, the rate of nitrogen deposition is far below the 30 kgN ha/yr at which nitrogen deposition can be considered to have an adverse effect upon the saltmarsh within the site.

Other atmospheric pollutants

While sulphur dioxide (SO_2) is a significant contributor to acidification of habitats (leading to substantial changes in botanical composition over time), emissions are overwhelmingly influenced (82% of all emissions) by the

	output of power stations and industrial combustion processes, none of which will be associated with Sherford. In contrast, road traffic and domestic boilers are responsible for only 5% of all emissions. The increase in sulphur dioxide emissions due to the Sherford development will therefore be negligible. Low-level ozone (O_3) is unlike the other pollutants, in that it is not emitted directly into the atmosphere, but is a secondary pollutant produced by a complex reaction between nitrogen dioxide (NO_2), hydrocarbons and sunlight. Unlike the other pollutants, it cannot therefore be directly related to increases in housing, traffic etc. Moreover, the physical range of this pollutant is sufficiently great that the source of emission and location of deposition can cross national boundaries. As such, low-level ozone can only be practically addressed at the national and international level and cannot be assessed within this assessment. <u>Discharge of treated sewage effluent</u> South West Water is currently developing its future foul sewerage strategy in conjunction with the Environment Agency and is looking at the possibilities of a new treatment facility to handle wastewater from the Sherford development and other locations. The strategy is insufficiently developed at this stage for a detailed assessment to be possible as part of this application. However, the Environment Agency has confirmed that any future discharge consents will be subject to an Appropriate Assessment before they are permitted. For the discharges to be consented, the assessment must demonstrate that discharges will not have an adverse effect upon Plymouth Sound and Estuaries SAC or any other European sites. Given these controls and based on the information available to date, the Sherford development is considered to have a negligible impact on European sites due to wastewater discharge, leading to an effect that is not significant. <u>Surface water runoff</u> The SAC already receives discharges of sewage and trade effluent estimated at 95,304 and 121m^3 d^{-1}, respectively (Langston et al 2003). In addition, the Sherford farmland will already be contributing nutrients to the Yealm through runoff. The Environment Agency have stipulated that surface water runoff into the watercourses at Sherford (and therefore the River Yealm) as a result of the development must not exceed current greenfield rates. The majority of surface water runoff will therefore be diverted to groundwater and attenuation ponds. For the small amount of runoff directed into the streams on site, pollutants will be removed through the use of oil

	interceptors. Given that this runoff will be largely from hardstanding and thus no longer be greenfield, inputs of nutrients into the Yealm will actually decrease somewhat due to the development. Overall, therefore, the potential adverse impacts of runoff are considered negligible.

Part 4: Mitigation measures			
Describe what mitigation measures are to be introduced to avoid, reduce or remedy any significant adverse effects on the integrity, structure and function of the Natura 2000 site.			
List measures to be introduced	Explain how the measures will avoid the adverse effects on the integrity of the site	Explain how the measures will reduce adverse effects on the integrity of the site	Provide evidence of how they will be implemented and by whom
	None required		
Assessment of significant residual adverse impacts		**None**	
Assessment of alternative solutions where significant residual impacts remain		**Not Applicable**	

APPENDIX: AIR QUALITY ASSESSMENT METHODOLOGY

The assessment follows the procedure set out in the Design Manual for Roads and Bridges Interim Advice Note 61/05 for undertaking environmental assessment of air quality for sensitive ecosystems in internationally designated nature conservation sites and SSSIs. As the DMRB screening method is not appropriate for the scheme being assessed, pollutant concentration values have been obtained through the use of detailed dispersion models instead.

ADMS roads has been used to calculate the annual mean concentration of NOx at each receptor, due to road traffic emissions associated with the Sherford development and for baseline road traffic emissions.

Predicted contributions, to the total annual mean concentrations of NOx at receptors derived, from direct emissions of NOx from the Langage energy facility have been taken from the Environmental Statement for that proposal. The impact of Langage energy facility has not been re-modelled as part of this assessment.

In order to calculate in combination effects of NOx from predicted 2016 baseline road traffic emissions, emissions from Langage energy facility, road traffic emissions associated with the operation of Sherford and ambient background levels of NOx, contributions from all these sources have been included in the quantitative assessment. The method set out in IAN 61/05 has been adapted such that the contribution from Langage has been added to the road traffic contribution at the appropriate point in the assessment procedure.

Summary of Dispersion Model Input Data
CERC's dispersion model software 'ADMS Roads' is derived from 'ADMS Urban' and both of these models have an extensive published track record of use in the UK, for the assessment of local air quality impacts, including model validation and verification studies.

The general model conditions used in the assessment are summarised in the table below. Other more detailed aspects needed to model the dispersion of emissions are considered below.

Table: General ADMS Roads Model Conditions

Variable	Input
Surface roughness at source	0.5 m
Monin-Obukhov length	30 m
Receptor location	x,y coordinate as in Table 1, z = 0 m
Source location	x,y coordinates determined by GIS
Emissions	NOx
Emissions inventory	DMRB 2003
Sources	LDV, HDV as peak pm flow (veh/hr) based on data used in the transport assessment.
Background pollutant concentrations	None, value from National Air Quality Information Archive added manually
Meteorological data	1 year of hourly sequential data from Meteorological Station in Plymouth
Diurnal emissions profile	Hourly data file, fraction of peak flow. Same profile for all days of week.
Model output	Annual mean concentration of NOx ($\mu g/m^3$) at receptors

Traffic Data
Traffic data for use in this assessment are derived from the data presented in the Transport Assessment for the development. This includes data for all other developments that have been considered within the transport assessment as potentially contributing to traffic volumes on roads in the study area over the study period.

ADMS Roads is able to apply a single source strength profile to each model scenario, to reflect changes in traffic flow rates during the day. The traffic assessment produced two diurnal profiles, one for the A38 and another for local roads on a weekday basis. This approach is likely to over predict traffic exhaust emissions on Sundays and during the school holidays and as such is likely to result in a robust assessment of impacts.

Meteorological Data
One year (2004) of hourly sequential data was used in this study. It is derived from meteorological measurements taken in Plymouth. This data was prepared by the MET Office as being the most representative set of meteorological data available for the development site. This data represents the full range of meteorological conditions that where experienced in the study area during 2004 and as such the annual mean pollutant concentration predicted by the model represents the annual mean concentration of NOx that receptors would be exposed to over the whole year.

TAMAR ESTUARIES COMPLEX SPA

The Tamar Estuaries Complex is designated as a Special Protection Area (SPA) for birds under the EU Habitats Directive.

This Directive is enacted into UK law by the Conservation (Natural Habitats &c.) Regulations 1994. Regulation 48 of The Regulations requires that the relevant 'competent authority', before deciding to undertake, or give consent for, a project that is likely to have a significant effect on a European site in the United Kingdom, must carry out an 'appropriate assessment' of how impacts upon that site's integrity, structure and function will translate into effects on the favourable conservation status of the interest features for which the site was designated.

In this case the competent authorities are Plymouth City Council & South Hams District Council. It is the responsibility of the party applying for consent to provide the 'competent authority' with any information that they may reasonably require for the purposes of the assessment. The competent authority will usually make the assessment in consultation with Natural England.

Scott Wilson were commissioned by Red Tree LLP to provide the information required by the competent authorities/Natural England to make an appropriate assessment under Regulation 48 of the Conservation (Natural Habitats &c.) Regulations 1994 concerning the effects of the Sherford development upon the Tamar Estuaries Complex SPA. This report was produced in consultation with Natural England.

Part 1: Description of project and Natura 2000 site	
Brief Description of Project or Plan	Construction of a new community of up to 5,500 units and associated landscaping on approx. 400 ha of farmland south of the A38 at Sherford, immediately east of Elburton, Plymouth.
Brief Description of Natura 2000 Site (including code number)	The Tamar Estuaries Complex (comprising the estuaries of the rivers Tamar, Lynher and Tavy) is designated as a Special Protection Area for birds (UK9010141). The broader lower reaches of the rivers form extensive tidal mudflats bordered by saltmarsh communities. The mudflats contain extensive feeding grounds for waterbirds, while the saltmarsh component comprises important feeding and roosting areas for large numbers of wintering and passage waterbirds. The site is specifically designated for supporting at least 8.4% of the British wintering population of little egret *Egretta garzetta* and at least 15.8% of the British wintering population of avocet *Recurvirostra avosetta*.
List of references and organisations consulted during the assessment	Colin Powlesland, Environment Agency Air Quality Policy Manager Conservation (Natural Habitats &c) Regulations 1994 Council Directive 79/409/EEC on the Conservation of Wild Birds 1979 Department of Transport. 2005. Interim Advice Note (IAN) 61/05. Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in

	Internationally Designated Nature Conservation Sites and SSSI's (Supplement to DMRB 11.3.1). HMSO, London. Dore CJ et al. 2005. UK Emissions of Air Pollutants 1970 – 2003. UK National Atmospheric Emissions Inventory. http://www.airquality.co.uk/archive/index.php English Nature Exeter Office Environmental Statement for Langage Energy Park, 2004 Langston, W.J., Chesman, B.S., Burt, G.R., Hawkins, S.J., Readman, J., Worsfold, P. 2003. Occasional Publication No. 14: Characterisation of the Southwest European Marine Sites – Summary Report. Marine Biological Association, Plymouth. Plymouth Sound and Estuaries SAC Natura 2000 Standard Data Form. JNCC, Peterborough. UK Air Pollution Information System. www.apis.ac.uk Wetland Bird Survey data were supplied by The Wetland Bird Survey (WeBS), a joint scheme of the British Trust for Ornithology, The Wildfowl & Wetlands Trust, Royal Society for the Protection of Birds and Joint Nature Conservation Committee (the last on behalf of the Countryside Council for Wales, the Environment and Heritage Service, Natural England (English Nature) and Scottish Natural Heritage)
Part 2: Description of impacts and effects of project on Natura 2000 site	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site	The development of up to 5,500 new homes at Sherford between 2008 and 2019 (along with associated infrastructure and increased vehicle use) can be expected to lead to an increase in atmospheric pollutants both due to this development alone and cumulatively with other developments in the southwest. In addition, without special consideration there is a risk that surface water discharges from the development into the streams on site could alter the flow and water quality of the River Yealm leading into the SAC.
Describe any possible direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the integrity, structure and function of the Natura 2000 site.	**Blade Strike** The Tamar Estuaries Complex SPA is designated for supporting internationally important populations of little egret and avocet. From scrutiny of Fig. 1 it can be seen that the major waterfowl sites within the wider Plymouth area are associated with the coastal estuarine system and Plymouth Sound. Birds differ in their susceptibility to wind turbines. Typical passerines (e.g. 'songbirds') are generally highly manoeuvrable and as such are able to avoid turbine blades; however, wind turbines are more of a risk to less manoeuvrable species such as waterfowl (particularly since waterfowl tend to congregate in large numbers).

	Air Quality The main ecologically relevant atmospheric pollutants associated with housing developments are oxides of nitrogen. Oxides of nitrogen (NOx) are formed during high temperature combustion processes from the oxidation of nitrogen in the air. The principal source of oxides of nitrogen is road traffic, which is responsible for approximately half of all emissions. In contrast, domestic and commercial sources (coal fires, home heaters and gas cookers for example) are responsible for only 4% of all NOx emissions[1]. Within a 'typical' housing development, by far the largest contribution to NOx (92%) will be made by the associated road traffic. Other sources, although relevant, are of minor importance (8%) in comparison. NOx concentrations are therefore greatest in urban areas where traffic is heaviest and are likely to increase as a result of increases in traffic associated with the Sherford development. An increase in the deposition of nitrogen from the atmosphere to soils is generally regarded to lead to an increase in soil fertility, which can have a serious deleterious effect on the quality of semi-natural, nitrogen-limited terrestrial habitats. This could potentially have a serious deleterious effect on the habitats that support the birds for which the Tamar Estuaries Complex SPA was designated. The calculated minimum critical loads[2] of nitrogen deposition (in $kg/Nha^{-1}yr^{-1}$) for the only habitat within the Tamar Estuaries Complex for which critical loads have been calculated[3] is 30 $kg/Nha^{-1}yr^{-1}$ A NOx level in excess of 30 $\propto gm^{-3}$ (the World Health Organisation critical level for the protection of vegetation as detailed within the Air Quality Limit Value Regulations 2001) or a nitrogen load in excess of 30 $kg/Nha^{-1}yr^{-1}$ can therefore be assumed to have a deleterious effect on habitats that the principal interest features of the Tamar Estuaries Complex SPA.
Part 3. Determination of significance	
Determine the significance of these impacts. Acknowledge uncertainties and any gaps in information	**Blade Strike** From scrutiny of the figure below, it can be seen that the major waterfowl sites within the wider Plymouth area are associated with the coastal estuarine system and Plymouth Sound. It is likely that the birds within these estuaries move from estuary to estuary in the course of a season. As such, the most likely route for waterfowl moving to and from the

[1] Dore et al. 2005

[2] Taken from the UK Air Pollution Information System. Critical loads are given as ranges – on a precautionary basis the critical load used here is the minimum figure in the range.

[3] Critical loads have not been determined for rivers and marine habitats, but a figure is available for saltmarsh

Tamar Estuaries Complex is by following the coastline, or by cutting across the open land between Wembury and Turnchapel, south of Plymouth. The risk of little egret and avocet on migration to or from the SPA colliding with the Sherford wind turbines is therefore considered to be negligible, leading to an effect that is not significant.

Air Quality

Tables 10.1 and 10.2 show the annual mean NOx and nitrogen deposition that have been calculated for the closest point of Plymouth Sound & Estuaries SAC (NGR 254110, 051623) for various years, calculated using the projected changes in traffic flows in and around the Sherford as a result of the development.

Table 10.1. Annual Mean NOx Concentration at Plymouth Sound & Estuaries SAC

	Scenario	NOx ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)
1	2005 baseline	7.71	7.60
2	2016	6.25	6.19
3	2016, with Sherford operational	6.30	6.21
	Difference between scenarios 2 and 3	**0.05**	**0.02**

The annual mean NO_2 value predicted at the SAC is well below the EU limit value / Air Quality Strategy objective of 30 $\mu g/m^3$, and the change of 0.02 $\mu g/m^3$ is well below the 2 $\mu g/m^3$ level for concern as stated in the Department of Transport (2005).

Table 10.2. Annual Mean rate of Nitrogen Deposition at Plymouth Sound & Estuaries SAC, for the only habitat for which critical loads have been determined

	Scenario	Deposition (kg N ha/yr)
1	2005 baseline	14.14
2	2016	11.33
3	2016, with Sherford operational	11.33
	Difference between scenarios 2 and 3	**<0.01**

The nitrogen load for Plymouth Sound and Estuaries SAC closest to Sherford is well below the minimum critical load and the additional contribution due to Sherford is negligible. Since Tamar Estuaries Complex SPA is situated at a greater distance from Sherford than Plymouth Sound & Estuaries SAC, the contribution of Sherford to atmospheric pollution on this site will be even lower and can therefore also be considered to be negligible.

[4] Increases in road traffic associated with existing permitted developments are already factored into the 2016 baseline

'In Combination' Effects

The Sherford development will inevitably add cumulatively to overall NOx levels, but it is necessary to determine whether this cumulative increase will have a significant adverse effect.

This is best done by assessing the effects of Sherford in combination with the construction of a new power station at Langage Energy Park, since this project has the greatest potential for an adverse effect on air quality within the Plymouth area, dwarfing that of all other developments[4]. It is therefore necessary to determine whether the Sherford development combined with both the predicted 2016 traffic levels *and* the Langage Energy Park would result in a rate of nitrogen deposition that is greater than that which has been determined to have a deleterious effect upon key habitats within each of the three European sites.

Table 10.3. Annual Mean rate of Nitrogen Deposition at Plymouth Sound & Estuaries SAC, for the only habitat for which critical loads have been determined, when Langage Power Station is taken into consideration.

	Scenario	**Deposition (kg N ha/yr)**
1	2005 baseline	14.14
2	2016 without Langage Energy Park	11.33
3	2016 with Langage Energy Park in operation	11.36
4	2016 with both Langage Energy Park and Sherford operational	11.36
	Difference between scenario 3 and scenario 4	**<0.01**

Table 10.3 shows that the Sherford development will make a negligible contribution of less than 0.01 kgN ha/yr to nitrogen deposition at Plymouth Sound & Estuaries SAC, and that even when considered cumulatively with Langage Energy Park, the rate of nitrogen deposition is far below the 30 kgN ha/yr at which nitrogen deposition can be considered to have an adverse effect upon the saltmarsh within the site. Given that the Tamar Estuaries Complex is even more distant, the rate of nitrogen deposition at this site as a result of Sherford and Langage will also be negligible.

Other atmospheric pollutants

While sulphur dioxide (SO_2) is a significant contributor to acidification of habitats (leading to substantial changes in botanical composition over time), emissions are overwhelmingly influenced (82% of all emissions) by the output of power stations and industrial combustion processes, none of which will be associated with Sherford. In contrast, road traffic and domestic boilers are responsible for only 5% of all emissions. The increase in sulphur dioxide emissions due to the Sherford development will therefore be negligible.

	Low-level ozone (O_3) is unlike the other pollutants, in that it is not emitted directly into the atmosphere, but is a secondary pollutant produced by a complex reaction between nitrogen dioxide (NO_2), hydrocarbons and sunlight. Unlike the other pollutants, it cannot therefore be directly related to increases in housing, traffic etc. Moreover, the physical range of this pollutant is sufficiently great that the source of emission and location of deposition can cross national boundaries. As such, low-level ozone can only be practically addressed at the national and international level and cannot be assessed within this assessment.

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	None required		
Assessment of significant residual adverse impacts		**None**	
Assessment of alternative solutions where significant residual impacts remain		**Not Applicable**	

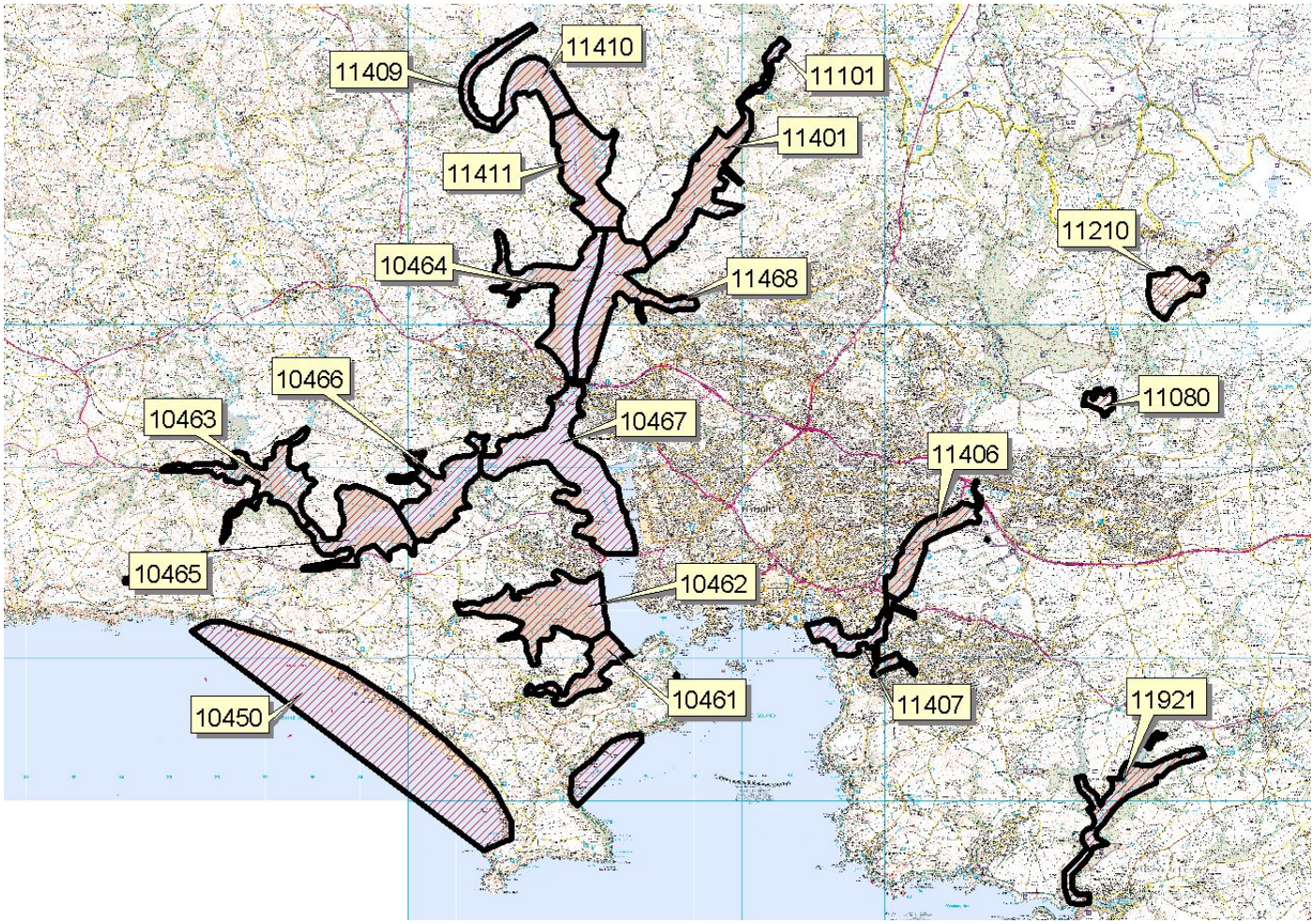

Figure 1. Wetland Bird Survey Core Count areas. This illustrates the major areas for waterfowl around Plymouth and their spatial relationship

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Summary of Dispersion Model Input Data

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The general model conditions used in the assessment are summarised in the table below. Other more detailed aspects needed to model the dispersion of emissions are considered below.

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Emissions inventory	DMRB 2003
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Background pollutant concentrations	None, value from National Air Quality Information Archive added manually
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Model output	Annual mean concentration of NOx ($\mu g/m^3$) at receptors

Traffic Data

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ADMS Roads is able to apply a single source strength profile to each model scenario, to reflect changes in traffic flow rates during the day. The traffic assessment produced two diurnal profiles, one for the A38 and another for local roads on a weekday basis. This approach is likely to over predict traffic exhaust emissions on Sundays and during the school holidays and as such is likely to result in a robust assessment of impacts.

Meteorological Data

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