2011 Air Quality Progress Report for Gwynedd Council

In fulfillment of Part IV of the Environment Act 1995
Local Air Quality Management

June 2011

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Executive Summary

Under the Environment Act 1995, Local Authorities are required to undertake regular review and assessments of air quality. Gwynedd Council is now undertaking the fourth round of air quality review and assessments with this progress report following on from the Update and Screening Assessment Report 2009 and the Progress Report for 2009 (August 2010).

Gwynedd Council has carried out a review and assessment of air quality within it's boundary which fulfils the requirements of the Local Air Quality Management process in Part IV of the Environment Act (1995) and the Air Quality (Wales) Regulations 2000 and the Air Quality (Amendment) (Wales) Regulations 2002.

This Air Quality Progress Report provides a summary of all available monitoring data for the previous 12 months and to identify where any developments which could have an effect on air quality. This report also continues with the fourth round of the Review and Assessment process which began in 1999. This document includes the latest data from 2010 but also considers the years 2008 and 2009. Any changes that have occurred and how they would affect air quality since the last round will be investigated.

During 2010 Gwynedd Council has conducted monitoring for Nitrogen Dioxide at various roadside locations and work has started on setting up automatic Sulphur Dioxide monitoring at a steam locomotive site which was identified in the Updating and Screening Assessment 2009.

Gwynedd Council only carried out Nitrogen Dioxide monitoring through the use of diffusion tubes during 2010. All monitoring locations apart from 2 were below the Annual Mean Objective of 40 μg/m^3. A comparison of 2010 data with the previous 2 years results also show that Nitrogen Dioxide levels have demonstrated a rise at all locations.

Monitoring location C2 which is a kerbside monitoring position adjacent to the 'Morrisons' roundabout on the A487 in Caernarfon, Gwynedd did exceed the 40 μg/m^3 objective with an annual mean concentration following bias adjustment of 53.71 μg/m^3. Also, monitoring location B4, a roadside location on the A55 showed an adjusted annual mean of 45.78μg/m^3. However, further investigation of these exceedances demonstrates that they do not pose an exposure risk to members of the public due to their location, and a prediction of exposure at the nearest locations of concern confirms that the concentrations fall well within the required objective. It is Gwynedd Council's intention to continue with its NO_2 monitoring programme through 2010. We have reduced our number of monitoring locations from 31 during 2009 to 16 in 2010. The locations that have showed the highest concentrations of NO_2 in the past, specifically within the town of Caernarfon and city of Bangor remain, whereas we no longer monitor in the more rural locations that have shown low concentrations.

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1 Introduction

1.1 Description of Local Authority Area

The County of Gwynedd lies between the area from Abergwyngregyn in the north to Aberdyfi in the south, and from the Llyn Peninsula in the west to Glan yr Afon in the east. Gwynedd covers an area of 225,000 hectares and has a population of approximately 120,000. The county shares it's inland boundary with four other counties; Conwy, Denbighshire, Powys and Ceredigion.

Gwynedd is predominantly rural, with a low population density. The main areas of population concentration are the University City of Bangor and Gwynedd Administration centre, Caernarfon, both on the south shore of the Menai Strait to the north west of the county. Other small towns include, Pwllheli, Porthmadog, Blaenau Ffestiniog and Dolgellau.

The largest and busiest road within the county is the A55 connecting the port of Holyhead on Anglesey to the north west of England along the North Wales coast. It stretches approximately 20km through Gwynedd from Abergwyngregyn, around Bangor to the Britannia Bridge. The A470 which is the primary route between North and South Wales traverses Gwynedd from Blaenau Ffestiniog to Mallwyd in the south. Another important road is the A487 which links Caernarfon and Bangor with the south of the County before merging with the A470 at Llan Ffestiniog, then continuing from the south of Dolgellau towards, Machynlleth and beyond.

Road traffic sources are the main concern with regard to air quality in Gwynedd. The dependence of the car and an increase in the influx of traffic from tourism has increased road traffic pollution in the past but newer greener cars on our roads seem not have caused levels of nitrogen dioxide to level off in the last few years.

1.2 Purpose of Progress Report

The Progress Report is intended to ensure continuity in LAQM process. Its objective is to provide an annual review and update on air quality issues, including developments that might be significant to air quality. Any significant developments can then be acted upon immediately, rather than waiting for the next full round of review and assessment.

Preparation of Progress Reports benefit the Gwynedd Council in a number ways which include the following:

- To provide a readily accessible source of up to date information on air quality, which may be useful to Local Authority officers for dealing with enquiries from members of the public, developers carrying out environmental assessments, and to assist in other areas such as transport and land use planning.

- To ensure continuity in maintaining resources, capability and staff skills for LAQM within Gwynedd Council.

- Helping to get maximum value from the monitoring carried out by Gwynedd Council.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM **in Wales** are set out in the Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138), Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298), and are shown in Table 1.1. This table shows the objectives in units of microgram's per cubic metre $\mu g/m^3$ (milligram's per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedances in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in Wales.

Pollutant	Concentration	Measured as	Date to be achieved by
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	5.00 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Table 1.2 Summarises the previous rounds of Review and Assessment and their outcome. No detailed assessments have been carried out and therefore no Air Quality Management Areas Declared.

Table 1.2 Summary of Previous Review and Assessments

Title Of Report	**Outcomes**
Gwynedd Council, Housing and Public Protection Department (1999): *Review and Assessment of Air Quality – First Stage*	No need for second stage review and assessment for: • Carbon Monoxide • Benzene • 1,3-Butadiene • Lead • Sulphur Dioxide Need second stage review and assessment for • Nitrogen Dioxide • PM_{10}
Gwynedd Council, Housing and Public Protection Department (2000): *Review and Assessment of Air Quality – Second Stage*	Risk of Nitrogen Dioxide objective being exceeded by the end of 2005 negligible. Risk of PM_{10} objectives being exceeded by the end of 2005 negligible.
Gwynedd Council, Housing and Public Protection Department (2003): *Review and Assessment of Air Quality – Updating and Screening Assessment*	No need to progress to a Detailed Assessment for any pollutant.
Gwynedd Council, Administrative and Public Protection Services, Resources Directorate (2004): *Progress report for 2003*	No exceedances in air quality objectives from roadside Nitrogen Dioxide monitoring, therefore no need to progress to Detailed Assessment
Gwynedd Council, Administrative and Public Protection Services, Resources Directorate (2005): *Progress report for 2004*	No exceedances in air quality objectives from roadside Nitrogen Dioxide monitoring, therefore no need to progress to Detailed Assessment
Gwynedd Council, Administrative and Public Protection Services, Resources Directorate (2006): *Review and Assessment of Air Quality – Updating and Screening Assessment*	No need to progress to a Detailed Assessment for any pollutant
Gwynedd Council, Administrative and Public Protection Services, Resources Directorate (2007): *Progress Report for 2006*	No exceedances in air quality objectives from roadside Nitrogen Dioxide monitoring, therefore no need to progress to Detailed Assessment. Short PM_{10} Study at Maes Padarn, Llanberis indicates longer term monitoring is needed.

Gwynedd Council, Administrative and Public Protection Services, Resources Directorate (2008): *Progress Report for 2007*	No exceedances in air quality objectives from roadside Nitrogen Dioxide monitoring, therefore no need to progress to Detailed Assessment. PM_{10} study at Cibyn Industrial Estate showed no exceedances in 24 hour mean. Intention to locate PM_{10} monitor at Maes Padarn during 2008 (as suggested in progress report for 2006
Gwynedd Council, Public Protection Service, Regulatory Services (2009): *Air Quality Update and Screening Assessment for 2008*	No exceedances in air quality objectives from roadside Nitrogen Dioxide monitoring during 2008. further detailed assessments not required. PM_{10} monitoring carried out near steam locomotive station. No exceedance of air quality objectives Identification of a location not previously assessed where steam trains may cause Sulphur Dioxide air quality objectives to be exceeded. Need to proceed to a Detailed Assessment
Gwynedd Council, Public Protection Service, Regulatory Department (2010): *Progress Report for 2009.*	One exceedance in the annual bias adjusted mean for Nitrogen Dioxide at 1 kerbside monitoring location. Further investigation of this exceedance demonstrates that it does not pose an exposure risk to members of the public due to its location, and a prediction of exposure at the nearest location of concern confirms that the concentration falls well within the required objective. Still need to progress to a Detailed Assessment of Sulphur Dioxide at one identified location.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

During 2010, the only ambient air quality monitoring carried out by Gwynedd Council was the monitoring of Nitrogen Dioxide by the use of roadside diffusion tubes. No automatic monitoring was undertaken during 2010.

During 2010 Gwynedd Council monitored nitrogen dioxide at 16 different locations close to traffic sources as indicated in table 2.1 below. Maps showing all tube locations can be found in Appendix A. Tubes were supplied by Bureau Veritas and analysed using Gradko International Ltd laboratories. The preparation method used was 50% TEA v / v in Acetone. Analysis carried out in accordance with laboratory's documented in house Laboratory Method GLM 6. The annual mean concentration values were achieved using a 0.99 bias adjustment supplied by the Review and Assessment website.

Table 2.1 Details of Non- Automatic Monitoring Sites

The table below details the location of all Nitrogen Dioxide diffusion tube monitoring locations within Gwynedd Council. All locations are at close to traffic sources.

Site Name	**Site Type**	**OS Grid Ref**	**Pollutants Monitored**	**In AQMA?**	**Relevant Exposure?** *(Y/N with distance (m) to relevant exposure)*	**Distance to kerb of nearest road** *(N/A if not applicable)*	**Worst-case Location?**
GCC/001 Bro Helen, Caernarfon (C1)	Roadside	X 248273 Y 262132	NO_2	N	2m	2m	N
GCC/002 Roundabout A487, Caernarfon (C2)	Kerbside	X 248148 Y 363115	NO_2	N	10m	1m	Y
GCC/003 Lon Cambell, Caernarfon (C3)	Urban Background	X 248480 Y 363456	NO_2	N	5m	N/A	N/A
GCC/004 Llys Meirion, Caernarfon (C4)	Roadside	X 248537 Y 363670	NO_2	N	5m	2m	N
GCC/005 Ffordd Bangor, Caernarfon (C5)	Kerbside	X 248892 Y 364120	NO_2	N	7m	1m	Y
GCC/007 Ffordd Gwynedd, Bangor (B2)	Urban Centre	X 258078 Y 372169	NO_2	N	10m	N/A	N/A
GCC/008 A4087, Bangor (B3)	Kerbside	X 257587 Y 371543	NO_2	N	2m	1m	Y
GCC/009 A55 Bangor (CO-LOC)	Roadside	X 254997 Y 369725	NO_2	N	Over 25m	2m	Y
GCC/010 A55 Bangor (B4)	Roadside	X 254997 Y 369725	NO_2	N	Over 25m	2m	Y
GCC/011 A5122, Bangor (B5)	Kerbside	X 256292 Y 371663	NO_2	N	Over 25m	1m	Y
GCC/012 Faenol Roundabout, Bangor (B6)	Kerbside	X 254286 Y 368835	NO_2	N	Over 25m	1m	Y
GCC/013 Bethesda (BETH 1)	Kerbside	X 261529 Y 367380	NO_2	N	10m	1m	Y
GCC/015 Llanwnda (LL1)	Roadside	X 247770 Y 358663	NO_2	N	5m	2m	Y

GCC/019 Pwllheli (PW 1)	Roadside	X 237387 Y 334942	NO_2	N	10m	3m	Y
GCC/022 Porthmadog (POR 1)	Roadside	X 256889 Y 338626	NO_2	N	1m	3m	N
GCC/031 Trawsfynydd (TRAWS 1)	Roadside	X 271067 Y 335013	NO_2	N	20m	2m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Results from diffusion tube monitoring carried out in 2010 are shown in Table 2.4 below. For comparison purposes, Table 2.2 includes annual mean concentrations for 2008 and 2009. Exceedances of the annual mean air quality objective of 40µg/m^3 are highlighted.

Table 2.2: Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2010 %	Annual mean concentrations (Bias Adjusted)(µg/m^3)		
					2008	2009	2010
C1	Bro Helen, Caernarfon	N	58	58	14.6	15.31	20.10
C2	A487 Roundabout, Caernarfon	N	83	83	37.84	**47.23**	**53.76**
C3	Cambell Road, Caernarfon	N	100	100	10.95	12.33	17.58
C4	Llys Meirion, Caernarfon	N	83	83	19.86	21.32	24.11
C5	Bangor Road, A470, Caernarfon	N	100	100	25.74	26.84	37.54
B2	Gwynedd Road, Bangor	N	92	92	18.1	17.28	25.03
B3	A4087, Bangor	N	83	83	29.1	27.39	35.93
CO - LOC	A55, Penrhosgarnedd, Bangor	N	100	100	29.59	28.27	39.48
B4	A55, Penrhosgarnedd, Bangor	N	83	83	30.74	30.31	**45.18**
B5	A512, Holyhead Road, Bangor	N	83	83	22.56	23.04	32.08
B6	Faenol Roundabout, A487, Bangor	N	100	100	23.93	25.85	38.53
BETH 1	A5, Bethesda	N	92	92	19.23	22.00	31.21
LL 1	A487 Llanwnda	N	92	92	20.7	24.58	31.11
PW 1	The Maes, Pwllheli	N	100	100	10.16	9.97	13.35
POR 1	Bus Stop, A487, High Street, Porthmadog	N	83	83	13.09	12.47	15.75
TRAWS 1	A470 Trawsfynydd	N	67	67	6.58	6.52	10.63

The Welsh Assembly Government has adopted an Annual Mean Objective of 40 μg/m^3 for Nitrogen Dioxide through the use of diffusion tube monitoring. Following collation of monitoring tube data and adjustment for bias (bias adjustment value of 0.99 from Review and Assessment website) all monitoring locations apart from two were below this threshold as can be seen from Table 2.2 above. A comparison of 2010 data with the previous 2 years results shows that Nitrogen Dioxide levels have risen at all 16 monitoring locations.

However, monitoring location C2 which is a kerbside monitoring position adjacent to the 'Morrisons' roundabout on the A487 in Caernarfon, Gwynedd did exceed the 40 μg/m^3 objective with an annual mean concentration following bias adjustment of 53.76 μg/m^3. Monitoring location B4, a roadside monitoring location on the A55 at Penrhosgarnedd, Bangor also showed an exceedance of the 40μg/m^3 at 45.18μg/m^3 following bias adjustment.

The Regulations make clear that likely exceedances of the objectives should be assessed in relation to *"the quality of air at locations which are situated outside buildings or other natural or man made structures, above or below ground, and where members of the public are regularly present".* It is particularly important that Review and Assessment focuses on those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective. Authorities should not consider exceedances of the objectives at any location where relevant public exposure would not be realistic.

In the case of the exceedance in location C2, given its location; it does not represent a relevant risk of exposure to members of the public. Further consideration was given to the level of exposure at the nearest location which would represent a relevant public exposure which is a residential home located 5 meters from the kerbside position.

The exceedance at B4, also taking into consideration its location does not represent a relevant risk of exposure to the public. The monitoring site is on the side of the A55 dual carriageway. The nearest location of relevant public exposure being a pavement on the bridge on Penrhos Road which crosses the carriageway at 10 meters distance away. It is unlikely that members of the public would be regularly present on this pavement and would spend a short period of time there.

Using the prediction equation located in Box 2.3 of LAQM.TG(09), the nitrogen dioxide concentration was predicted based on the local background concentration and the receptor distance from the monitoring positions of both locations. The method yielded a predicted concentration of Nitrogen Dioxide at the receptor of 28.90μg/m^3 location C2 and 33.5 μg/m^3 at B4, both of which which fall within the Annual Mean Objective of 40 μg/m^3 . A copy of both calculations and expected reduction curves are shown in Appendices.D and E.

The C2 monitoring position recorded 10 months of data and further study of the monthly data for this monitoring position does reveal exceedances of 60 μg/m^3 on 2 occasions during the monitoring period with reading s of 68.56 μg/m^3 in February 2009 and 60.09 μg/m^3 in November 2010. B4 also recorded 10 months of data and two exceedances of 60 μg/m^3 ; 66.5 μg/m^3 61.42 μg/m^3 in January and April respectively

Exceedances above 60 μg/m^3 can indicate a risk that the 1-hour objective of 200 μg/m^3 could be exceeded for these months, however the remaining 10 monitoring months data for both sites were all below 60 μg/m^3. This has ensured that the bias adjusted annual means for both locations did not exceed 60 μg/m^3. Laxen and Marner's 2003 *Analysis of the Relationship Between 1-Hour and Annual Mean Nitrogen Dioxide at roadside and Kerbside Monitoring Sites* on behalf of DEFRA has demonstrated that it is unlikely that 1-hour objective will be exceeded if the annual mean is less than 60 μg/m^3 . The annual mean at both C2 and B4 are within this threshold and it can be concluded that there is little risk of the 1-hour objective being exceeded at either location.

A comparison of Nitrogen Dioxide levels at location C2 with previous data reveals that annual mean concentrations have remained fairly constant in the in the mid 30's μg/m^3 from 2000 through to 2008 with the sudden rise being seen in 2009 and 2010 (as can be seen from Figure 2.3). Levels at B4 have risen from 2000 to 2003 then remained fairly constant in the upper twenties and lower thirties μg/m^3 until the sudden rise during 2010 (Figure 2.4).

Data on traffic volumes at both these locations was available for 2008 and 2010, but unfortunately not 2009. Annual Average Daily Total (AADT) on the A487 Caernarfon inner relief road actually fell to 20984 in 2010 from 21216 in 2008. AADT on the A55 Bangor Bypass rose from 31192 in 2008 to 32342 in 2010. A complete traffic data map was unavailable for the whole of Gwynedd, Any correlation between an increase in road traffic volume and levels of nitrogen dioxide will be looked into further in next years Updating and Screening Assessment

It is not Gwynedd Council's intention to carry out a Detailed Assessment at either location C2 or B4 with a view to establishment of a Air Quality Management Area.

Figure 2.3 10 Year Trend in Annual Mean Nitrogen Dioxide Concentration (µg/m^3) Measured at Site C2, A487 Roundabout, Caernarfon.

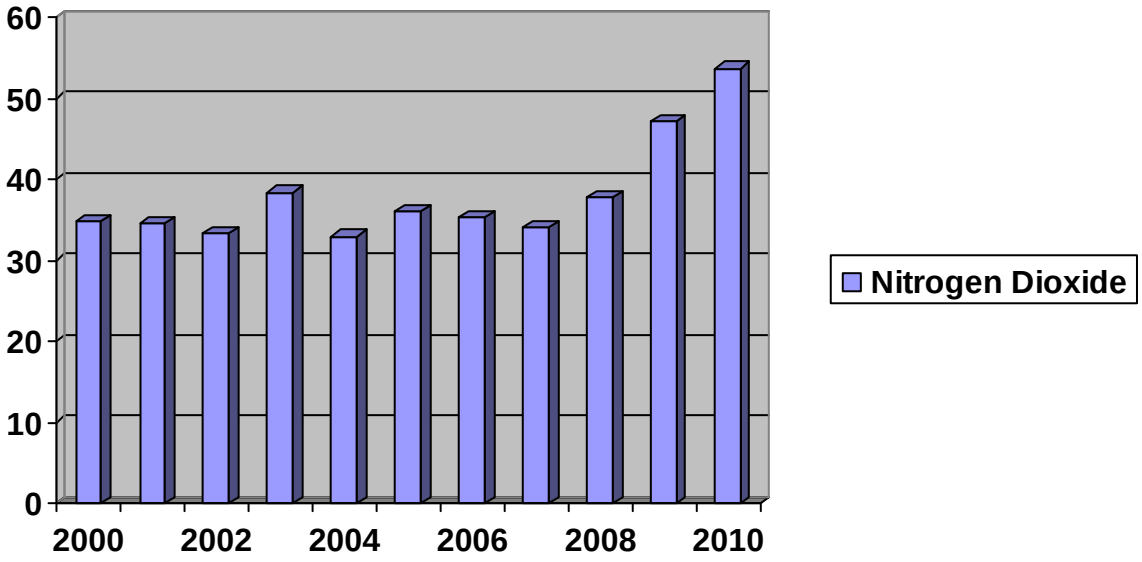
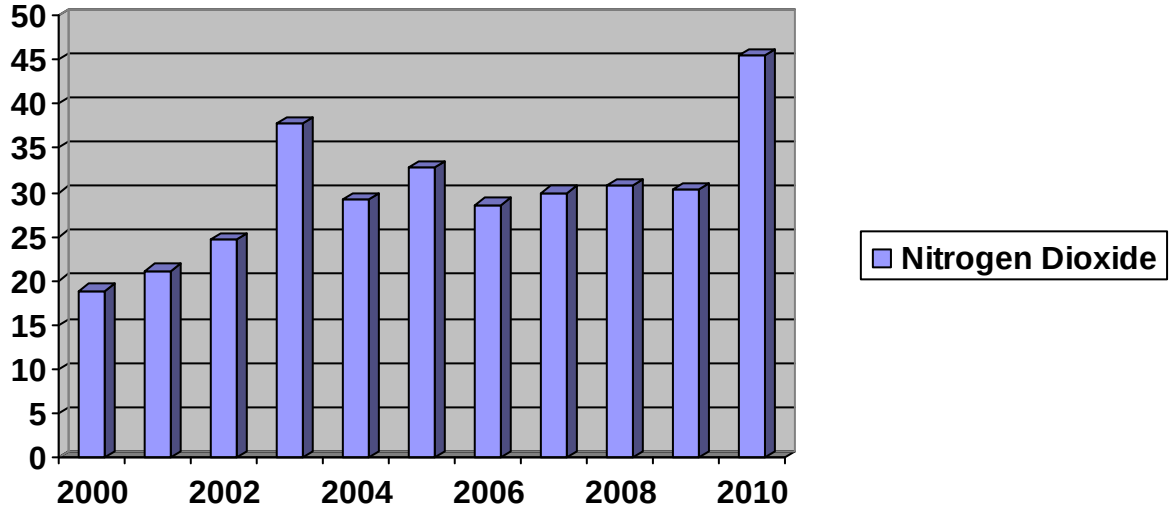


Figure 2.4 10 Year trend in Annual Mean Nitrogen Dioxide Concentration ((µg/m^3) Measured at Site B4, A55, Penrhosgarnedd, Bangor.



3. New Local Developments

3.1 Road Traffic Sources

Reference was made in the 2009 Updating and Screening Assessment and the Progress Report for 2009 to a new A487 Porthmadog and Tremadog Bypass, from Minffordd to Tremadog. During the monitoring period 2009, environmental data for the bypass was submitted. Work began on this road in June 2010 and it is due to open at the end of 2011.

This data consists of air quality predictions for the final scheme in respects of Nitrogen Dioxide, PM10 and NOX exposure to members of the public at sensitive receptor locations and also for ecological receptors. Review of the data reveals that there are no predicted exceedances for any pollutants on both public or ecological receptors. The data provided is shown in Appendix E.

This scheme will not be considered further as there are no predicted exceedances for any pollutants.

4. Conclusions and Proposed Actions

4.1 Conclusions from New Monitoring Data

Indicative monitoring was undertaken at 16 locations across the county in during 2010 at kerbside and roadside locations. Previous reports have identified location C2 A487 Roundabout in Caernarfon as having the highest mean average of all locations with a kerbside exceedance of the 40ug/m^3 Annual Mean Objective. During 2010, location B4 on the A55 at Bangor also showed an exceedance of the 40ug/m^3 objective. However, predictions of NO_2 levels to the nearest receptors confirms that there are no relevant public exposures at either location, and this remains the case.

4.2 Conclusions relating to New Local Developments

This progress report ahs identified the A487 Porthmadog , Minffordd and Tremadog bypass as a significant new development with the county. Air quality predictions from the Environmental Statement concludes that there will be no relevant public or ecological exposures as a result of the development for either Nitrogen Dioxide, PM10 or NOX.

4.3 Proposed Actions

Our Previous Updating and Screening Assessment (2009) identified a location not previously assessed where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m, and will need to proceed to a Detailed Assessment for sulphur dioxide. This location was at the Ffestiniog Railway Station at Porthmadog. This Detailed Assessment will be carried out during 2011 and at the time of submission of this Progress Report the study is underway. We have hired the use of a UV Fluorescence monitor form AEA Technology which will be in place at the station until the beginning of December 2011 to monitor SO_2 levels. The Data provided will be included in a Detailed Assessment to be submitted in April 2012.

Appendices

Appendix A: Diffusion Tube Location Maps

Appendix B: Nitrogen Dioxide Monthly Diffusion Tube Data 2009

Appendix C: List of Permitted Processes within Gwynedd.

Appendix D: Nitrogen Dioxide prediction with distance from Site C2, A487 Roundabout, Caernarfon.

Appendix E: Nitrogen Dioxide prediction with distance from Site B4, A55, Penrhosgarnedd, Bangor.

Appendix F: Air Quality Predictions for A487 Porthmadog, Minffordd and Tremadog Bypass.

Appendix A: Diffusion Tube Location Maps

Bro Helen, Caernarfon

Site Ref: C 1
WAQF Ref: GCC/001
NGR: 248273 262132
Parameter: NO_2

Graddfa/Scale 1:1000

Atgynhyrchir y map hwn o Ddeunydd yr Ordnance Survey gyda chaniatâd yr Ordnance Survey ar ran Rheolwr Llyfrfa Ei Mawrhydi. © Hawlfraint y Goron. Mae atgynhyrchu heb ganiatâd yn torri hawlfraint y Goron a gall hyn arwain at erlyniad neu achos sifil. Cyngor Gwynedd - 100023387 - 2005

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Roundabout nr./Cylchfan wrth Morrisons, A487 Caernarfon

Site Ref: C 2
WAQF Ref: GCC/002
NGR: 248147 363112
Parameter: NO_2

Scale/Graddfa 1 : 1000

Atgynhyrchir y map hwn o Ddeunydd yr Ordnance Survey gyda chaniatâd yr Ordnance Survey ar ran Rheolwr Llyfrfa Ei Mawrhydi. © Hawlfraint y Goron. Mae atgynhyrchu heb ganiatâd yn torri hawlfraint y Goron a gall hyn arwain at erlyniad neu achos sifil. Cyngor Gwynedd - 100023387 - 2005

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Cyffordd Lon Cambell/Junction Cambell Rd. & St. David's Rd, Caernarfon

Site Ref: C 3
WAQF Ref: GCC/003
NGR: 248489 363448
Parameter: NO_2

Graddfa/scale 1: 1000

Atgynhyrchir y map hwn o Ddeunydd yr Ordnance Survey gyda chaniatâd yr Ordnance Survey ar ran Rheolwr Llyfrfa Ei Mawrhydi. © Hawlfraint y Goron. Mae atgynhyrchu heb ganiatâd yn torri hawlfraint y Goron a gall hyn arwain at erlyniad neu achos sifil. Cyngor Gwynedd - 100023387 - 2009

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Llys Meirion, A487 Caernarfon

Site Ref: C 4
WAQF Ref: GCC/004
NGR: 248537 363670
Parameter: NO_2

Scale/Graddfa 1: 1000

Atgynhyrchir y map hwn o Ddeunydd yr Ordnance Survey gyda chaniatâd yr Ordnance Survey ar ran Rheolwr Llyfrfa Ei Mawrhydi. © Hawlfraint y Goron. Mae atgynhyrchu heb ganiatâd yn torri hawlfraint y Goron a gall hyn arwain at erlyniad neu achos sifil. Cyngor Gwynedd - 100023387 - 2005

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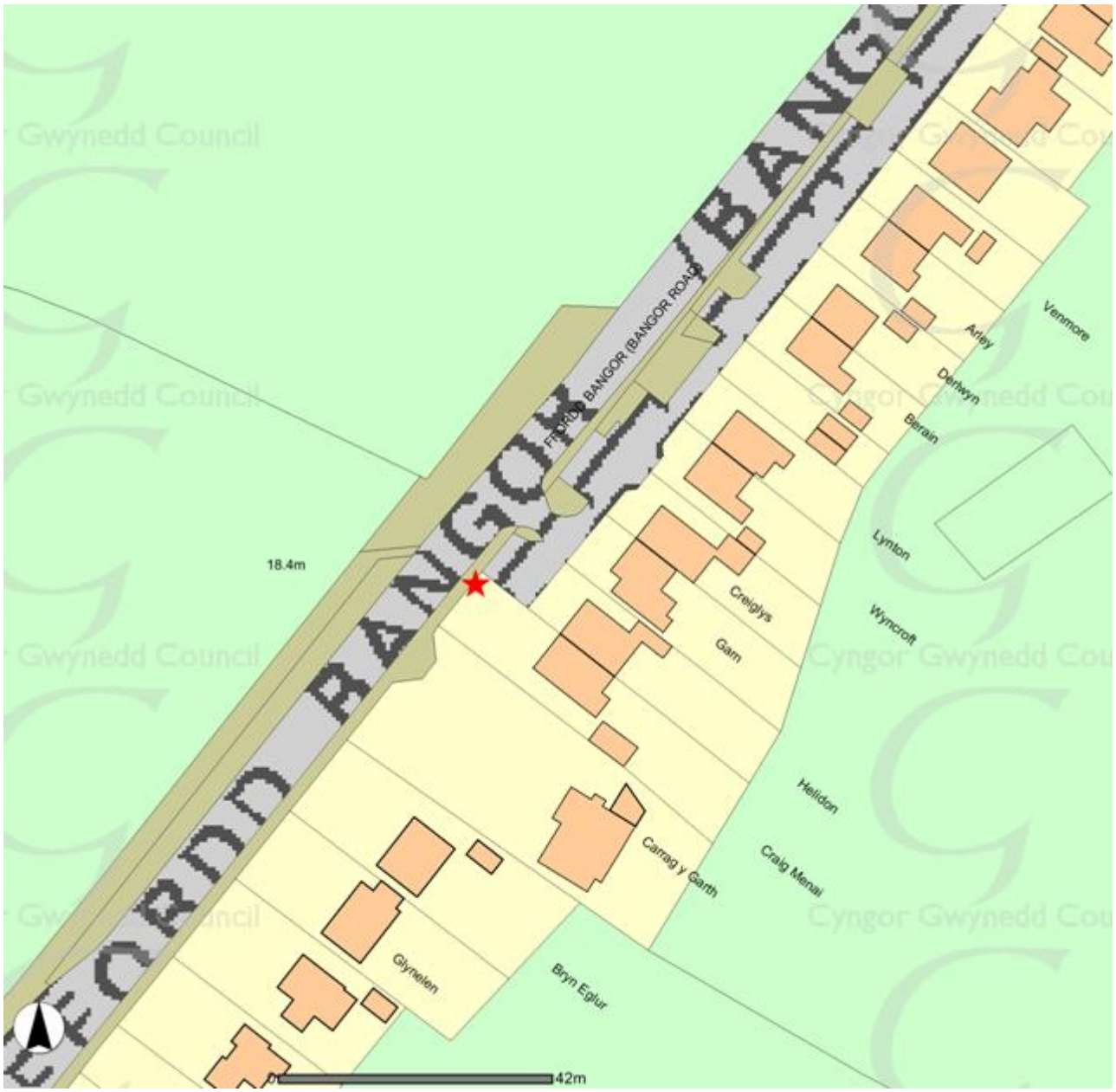
Ffordd Bangor, A487 Caernarfon

Site Ref: C5
WAQF Ref: GCC/005
NGR: 248892 364120
Parameter: NO_2



Scale/Graddfa 1 : 1000

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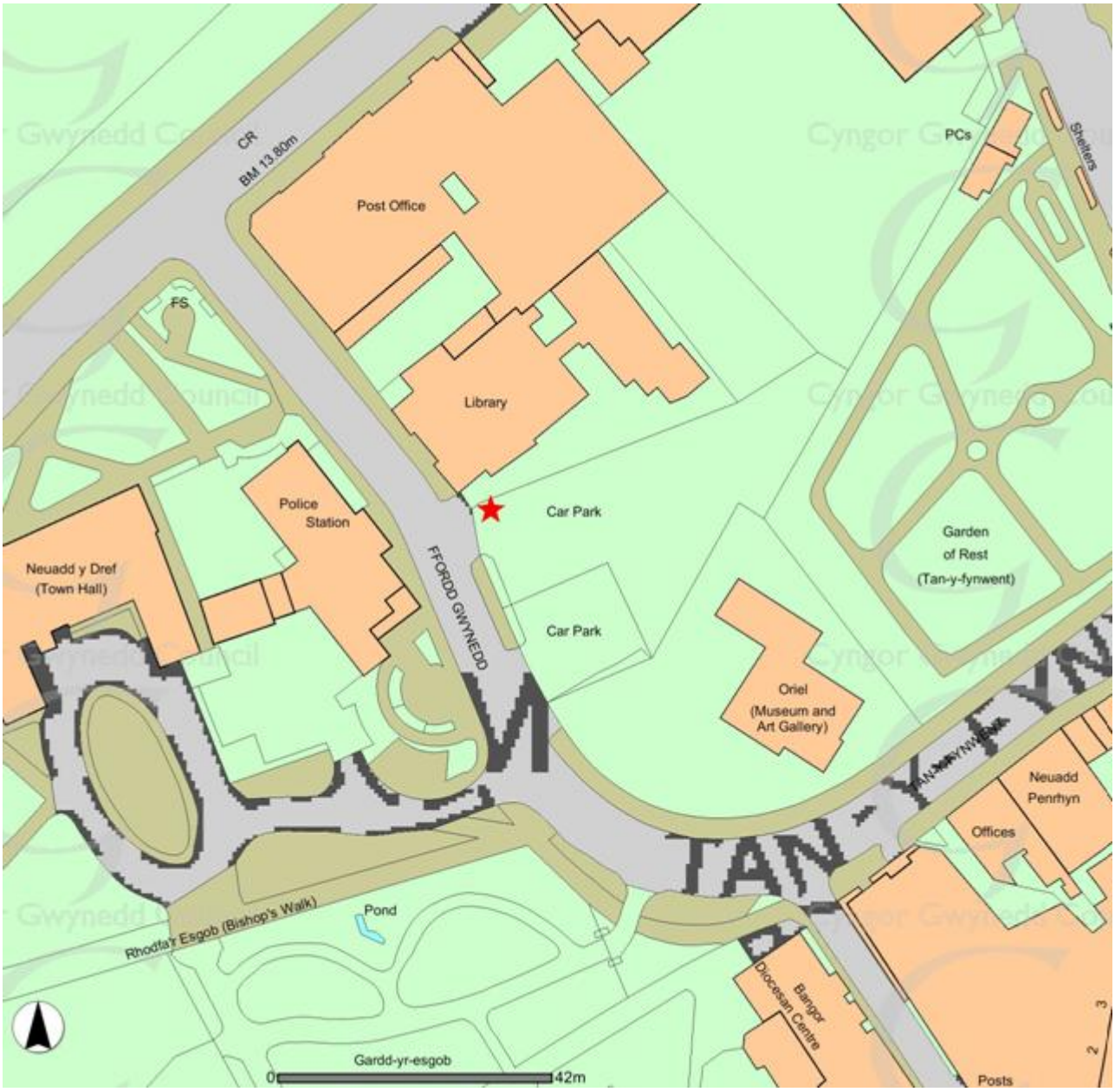
Ffordd Gwynedd/Gwynedd Road, Bangor

Site Ref: B 2
WAQF Ref: GCC/007
NGR: 258078 372169
Parameter: NO_2



Scale/Graddfa: 1 : 1000

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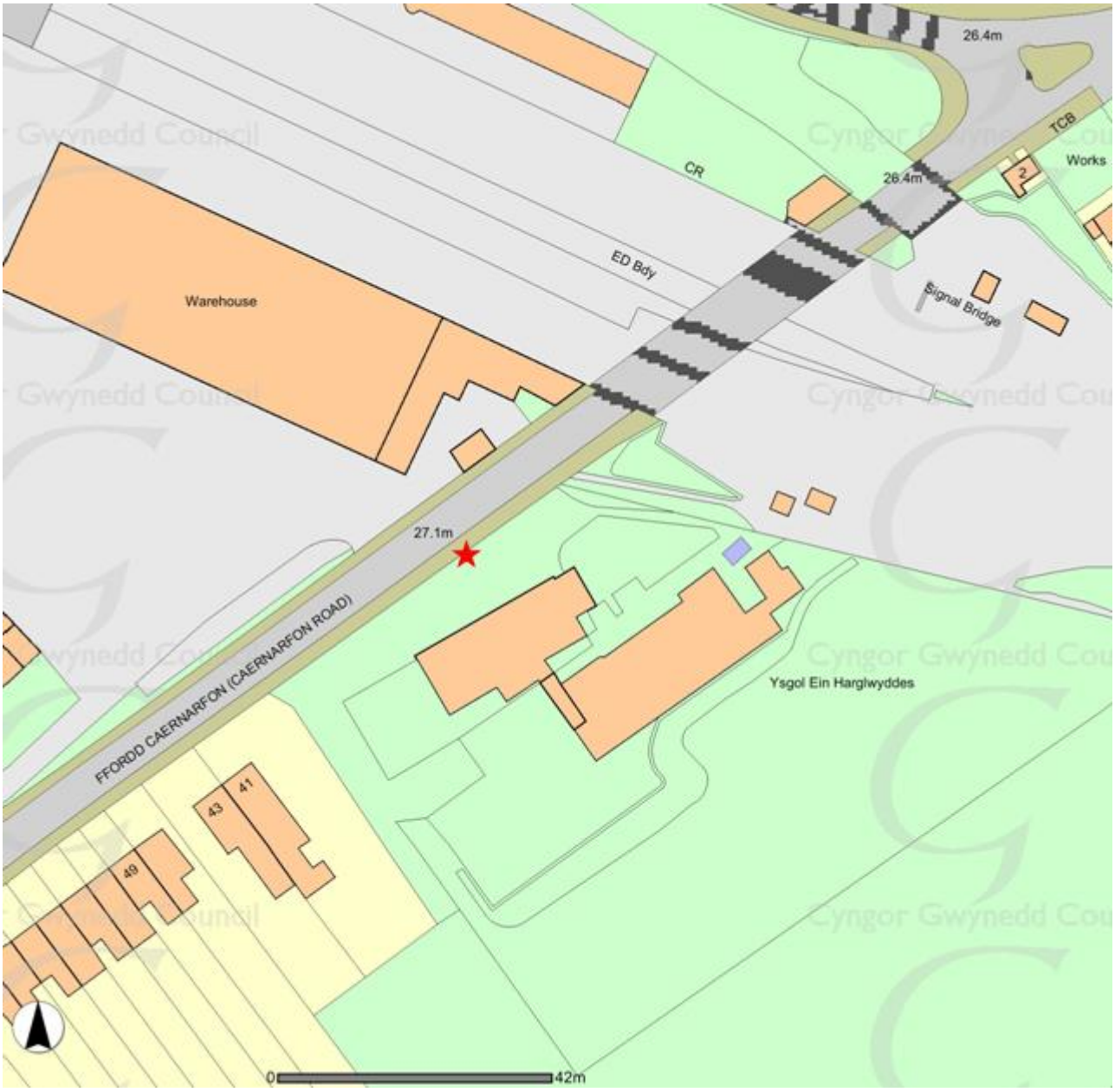
Ysgol Ein Harglwyddes/Our Lady's School, A4087 Bangor

Site Ref: B3
WAQF Ref: GCC/008
NGR: 257587 371543
Parameter: NO_2



Scale/Graddfa: 1 : 1000

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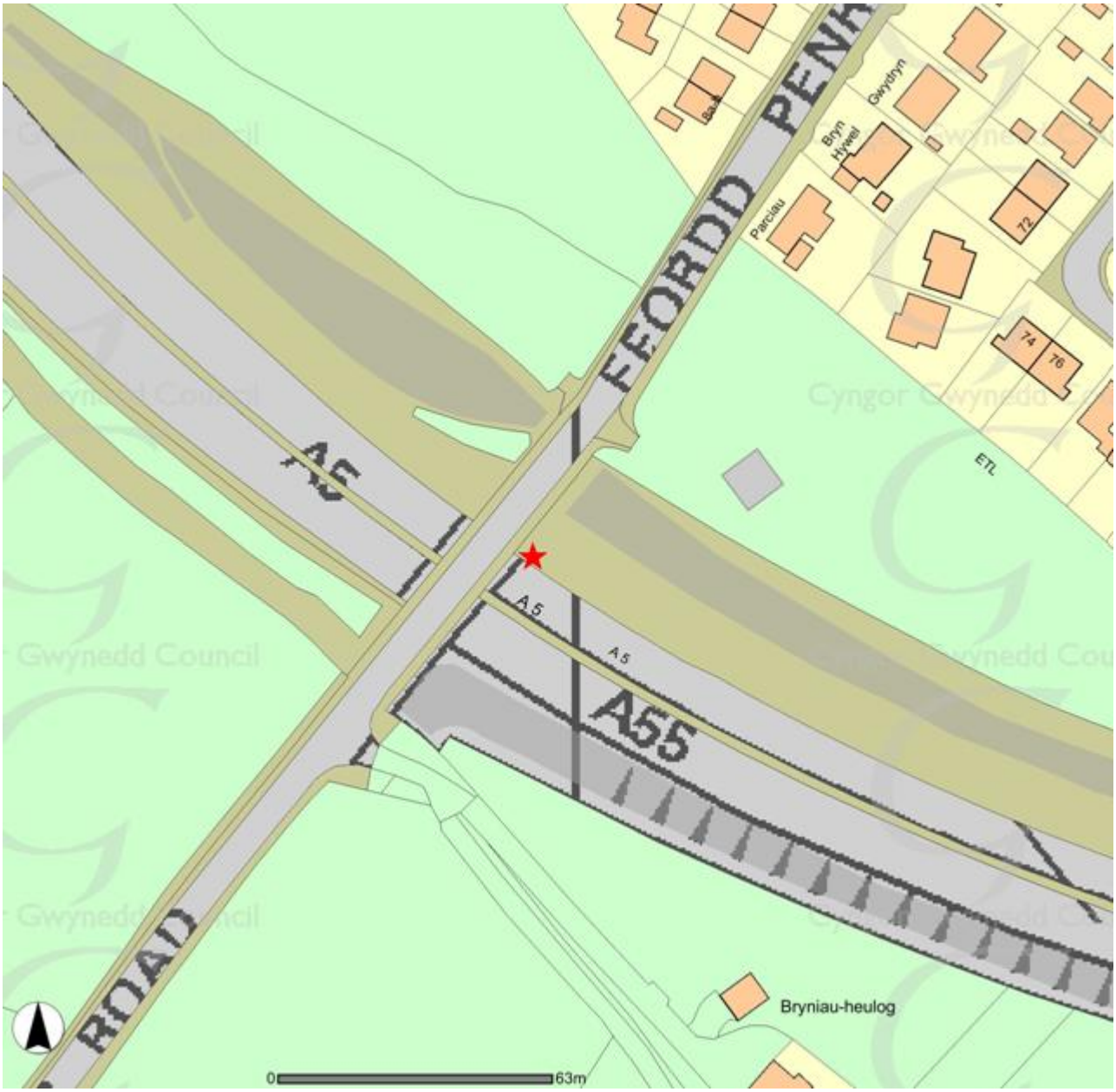
A55 Penrhosgarnedd, Bangor

Site Ref: CO-LOC (Collocated with B 4)
WAQF Ref: GCC/009
NGR 254900 369727
Parameter: NO_2



Scale/Graddfa: 1 : 1500

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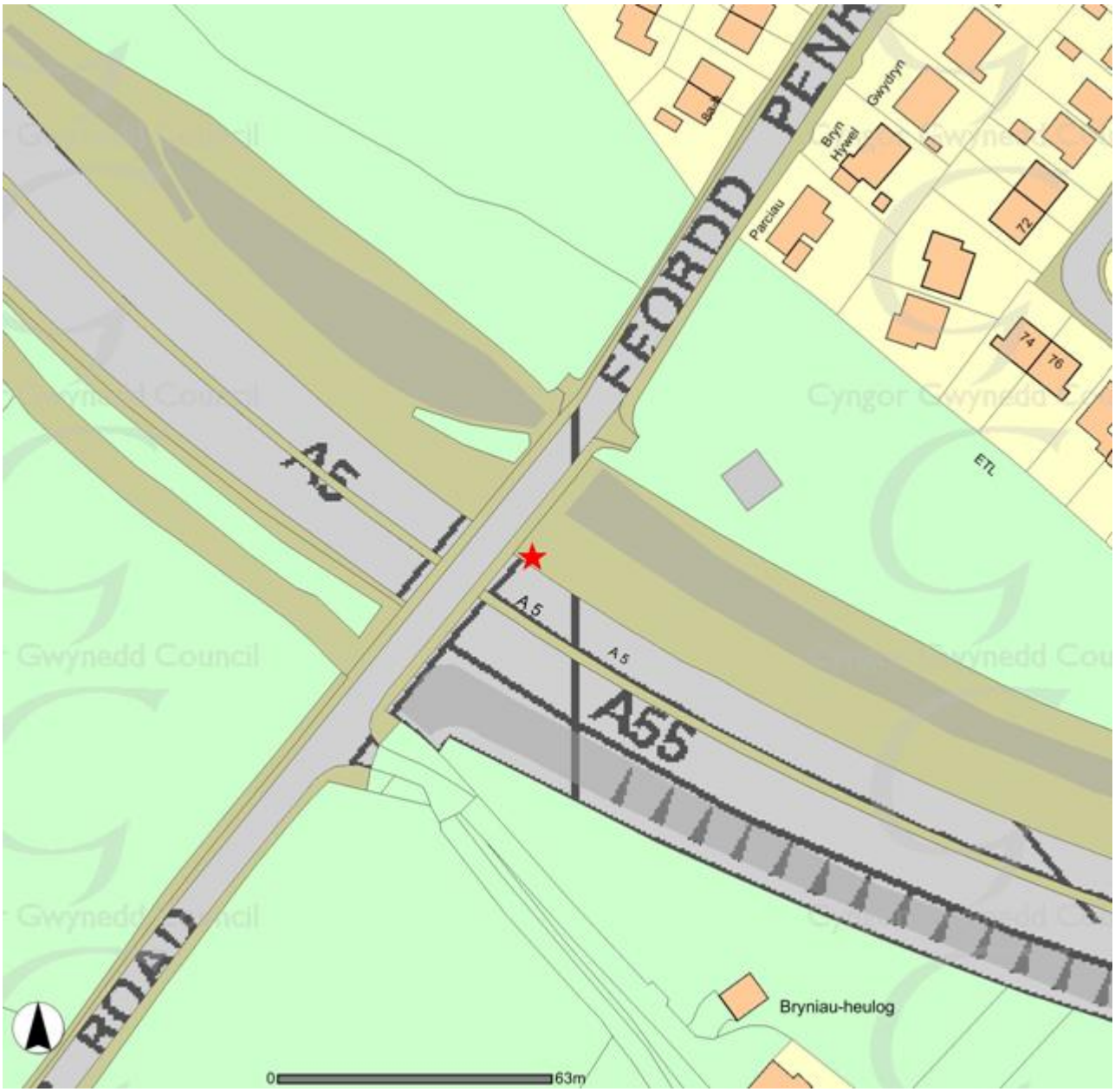
A55 Penrhosgarnedd, Bangor

Site Ref: B 4
WAQF Ref: GCC/010
NGR: 254990 369727
Parameter: NO_2



Scale/Graddfa: 1 : 1500

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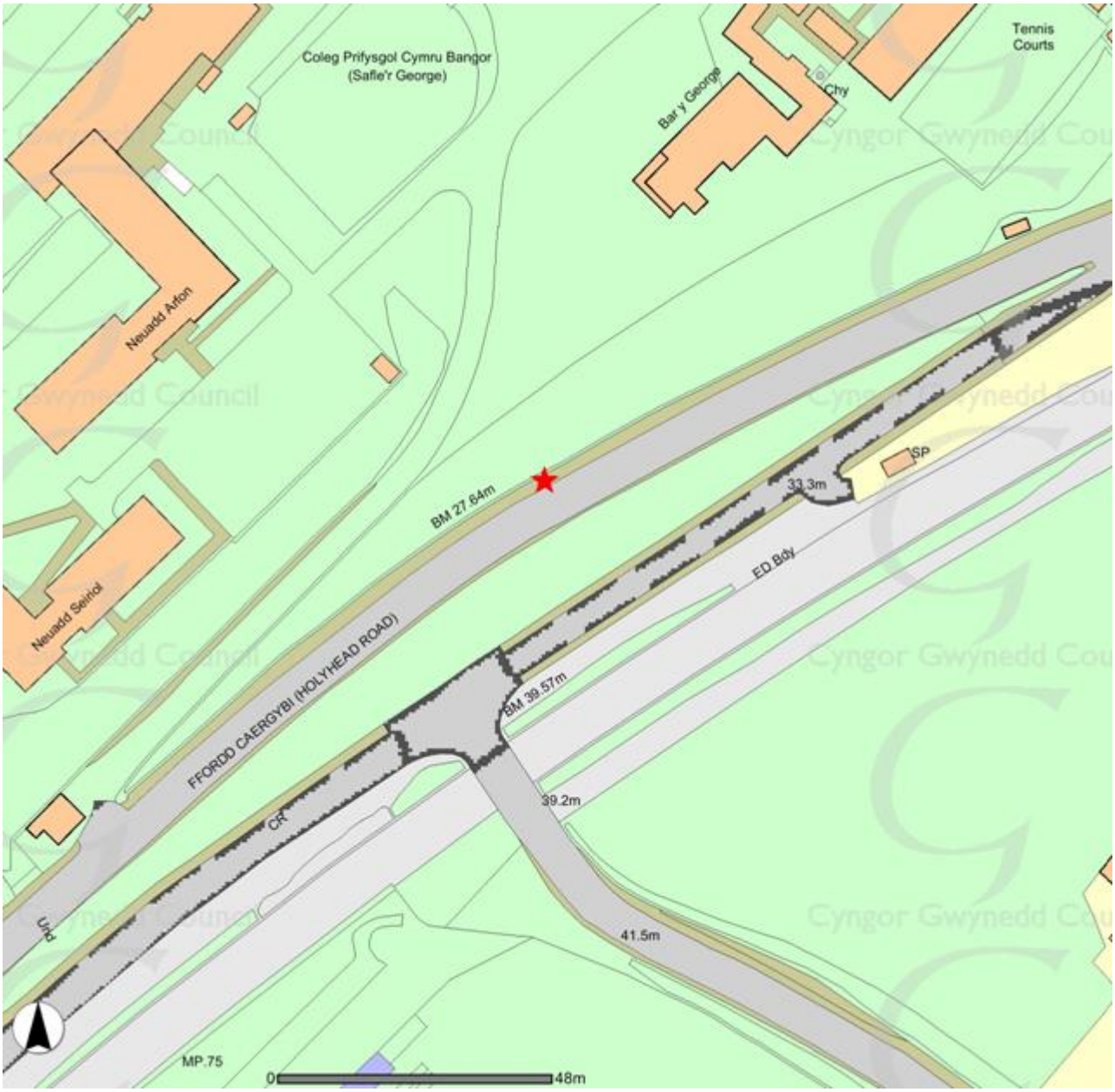
A5122 Ffordd Caergybi/Hollyhead Road, Bangor

Site Ref: B 5
WAQF Ref: GCC/011
NGR: 256292 371663
Parameter: NO_2



Scale/Graddfa 1: 1000

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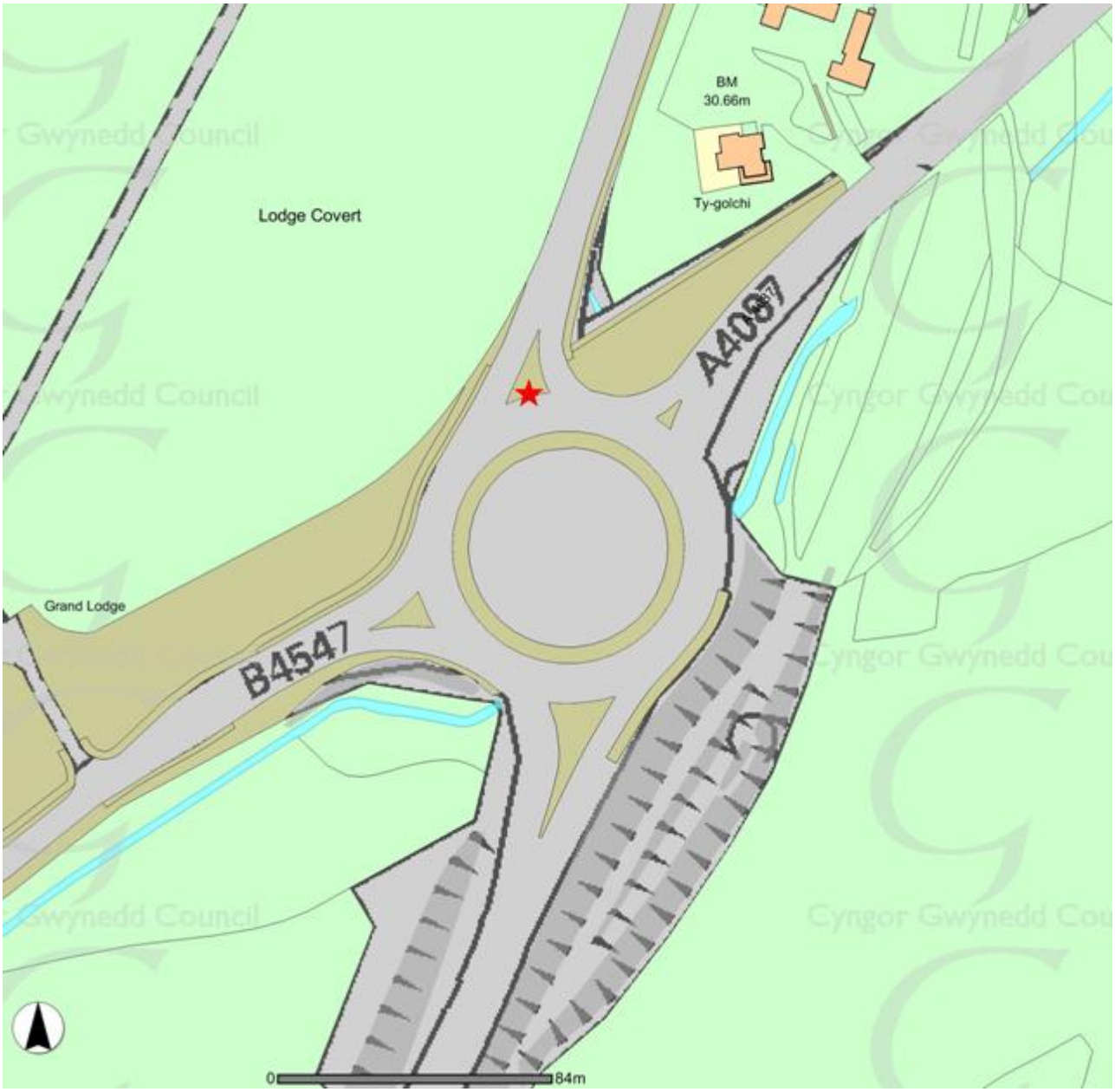
Faenol Roundabout, Bangor

Site Ref: B 6
WAQF Ref: GCC/012
NGR: 254286 368835
Parameter: NO_2



Scale/Graddfa: 1 : 2000

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A5 Bethesda

Site Ref: BETH 1
WAQF Ref: GCC/013
NGR: 261529 367380
Parameter: NO_2

Scale/Graddfa 1: 1000

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A487, Llanwnda

Site Ref: LL 1
WAQF Ref: GCC/015
NGR: 247770 358553
Parameter: NO_2

Scale/Graddfa 1 : 1000

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Y Maes, Pwllheli

Site Ref: PW 1
WAQF Ref: GCC/019
NGR: 237387 334942
Parameter: NO_2

Scale Graddfa 1 :1000

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Porthmadog

Site Ref: Port 1
WAQF Ref: GCC/022
NGR: 256919 338610
Parameter: NO_2

Scale/Graddfa 1: 1000

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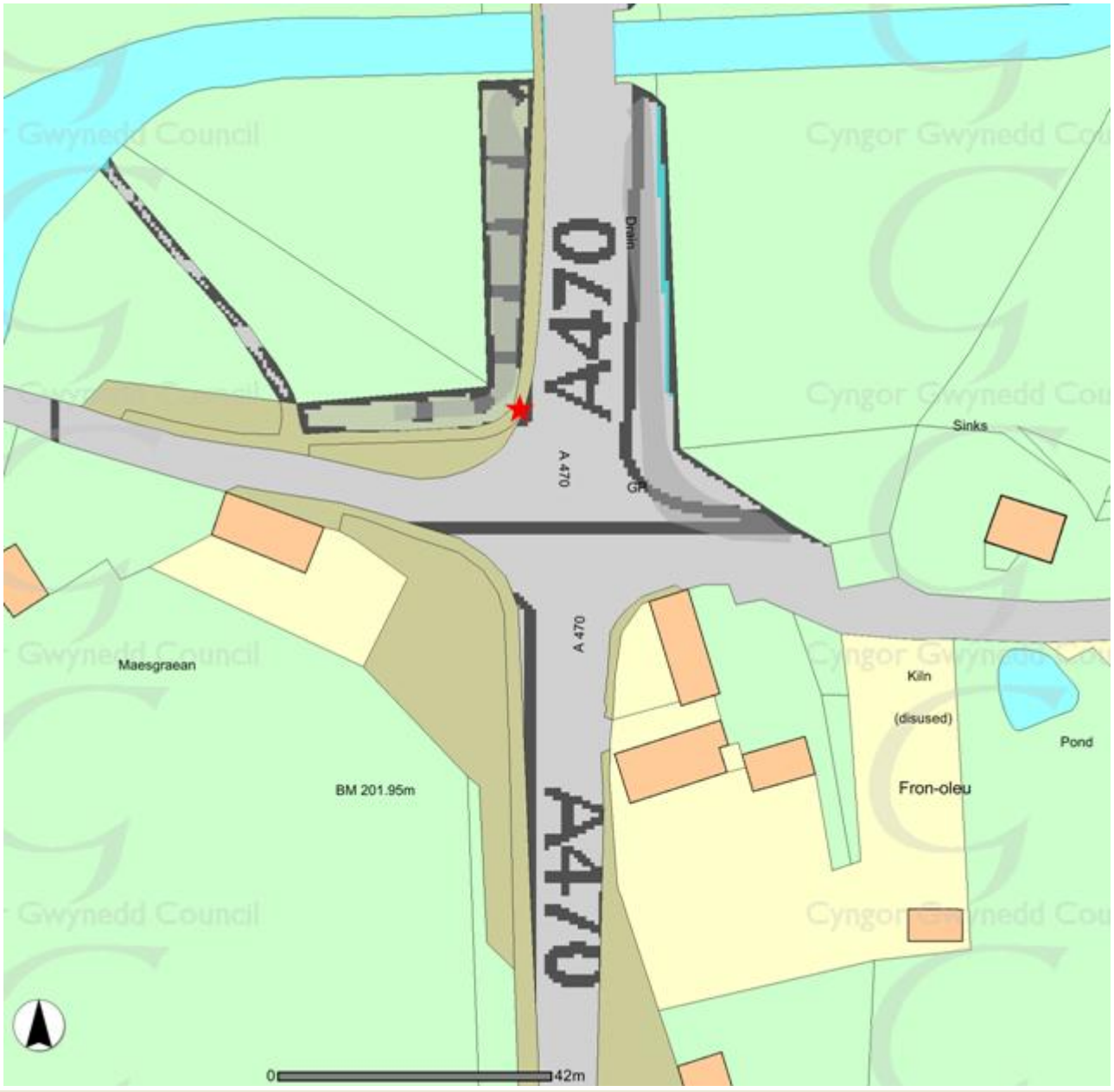
A470 Trawsfynydd

Site Ref: TRAWS 1
WAQF Ref: GCC/031
NGR: 271067 710350
Parameter: NO_2



Scale/Graddfa 1 : 1000

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Appendix B: Nitrogen Dioxide Diffusion Tube Data 2010

WAQF Ref	Gwynedd Ref	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Data Capture %	Unbiased Average	Biased Average 0.99
GCC 001	**C1**	19.47	27.93	18.52	21.27	-	-	-	-	-	16.99	21.21	23.10	58	21.21	20.10
GCC 002	**C2**	41.23	68.56	53.54	-	-	50.38	57.49	56.37	49.77	48.29	60.09	57.30	83	54.30	53.76
GCC 003	**C3**	41.61	24.54	26.45	14.91	9.91	7.53	12.29	10.22	11.33	14.07	19.51	20.70	100	17.76	17.58
GCC 004	**C4**	-	33.01	-	30.74	24.46	21.42	20.36	21.32	17.28	19.80	25.87	29.20	83	24.35	24.11
GCC 005	**C5**	39.39	49.51	38.32	40.12	41.42	36.27	39.76	35.10	26.10	32.09	41.61	35.30	100	37.92	37.54
GCC 007	**B2**	29.92	35.05	31.86	23.72	17.91	14.19	18.18	18.01	23.48	-	33.25	38.50	92	25.82	25.03
GCC 008	**B3**	37.48	48.56	37.49	40.18	28.62	25.20	34.22	25.37	-	38.80	46.94	-	83	36.29	35.93
GCC 009	**CO - LOC**	36.72	54.48	40.59	62.32	40.60	32.26	4.22	38.50	30.92	42.22	44.22	51.51	100	39.88	39.48
GCC 010	**B4**	66.55	55.74	41.31	61.42	34.76	25.79	30.77	57.17	35.32	-	-	47.6	83	45.64	45.18
GCC 011	**B5**	-	43.07	-	29.13	20.27	29.13	25.41	26.43	34.40	33.35	43.64	39.2	83	32.40	32.08
GCC 012	**B6**	50.87	45.19	36.81	51.13	32.67	30.33	27.83	34.56	29.76	37.87	46.25	43.8	100	38.92	38.53
GCC 013	**BETH 1**	-	44.34	29.73	55.11	25.16	24.02	21.85	25.56	23.67	25.25	39.64	32.50	92	31.53	31.21
GCC 015	**LL 1**	30.99	41.62	31.34	31.86	24.25	27.09	27.55	26.43	30.37	-	38.21	35.9	92	31.42	31.11
GCC 019	**PW 1**	15.05	19.65	13.68	11.84	9.73	6.86	8.67	10.11	7.45	13.92	23.34	21.40	100	13.48	13.35
GCC 022	**POR 1**	17.92	21.19	-	-	11.33	8.94	12.24	13.20	11.98	13.71	24.48	24.10	83	15.91	15.75
GCC 031	**TRAWS**	14.48	17.05	-	-	-	-	6.59	6.18	6.53	8.60	13.70	12.8	67	10.74	10.63

Appendix C: Environmental Permitting Regulations 2007: List of currently Permitted Process

Permit Reference No	Type (Part)	Operator	Process Address	Grid Reference	Process Undertaken	Guidance Note	Area
BL9941	A1	South Caernarvon Creameries Ltd	Rhyd-y-Gwystl, Chwilog, Pwllheli LL53 6SB	-	Treating and processing of milk >200 tonnes per day	-	DW
EPR/LP3037XK	A1	Rehau Ltd	Tanygrisiau, Blaenau Ffestiniog, Gwynedd LL41 9RY	-	PVC Compounding and Lamination	-	ME
ARF/EPA/009/A/93	B	RIGCYCLE TRADING AS WELSH SLATE	Penrhyn Quarry, Bethesda, Bangor, Gwynedd, LL57 4YG	SH 620 650	Quarry Process	PG3/08	AR
ARF/EPA/006/93	B	HOGAN BOS (ASPHALT) LTD	Caernarfon Road, Bangor, Gwynedd, LL57 4DA	SH 563 698	Quarry Process Including Road Stone Plant	PG3/15a	AR
ARF/EPA/005/93	B	HOGAN BOS (CONCRETE) LTD	Caernarfon Road, Bangor, Gwynedd, LL57 4DA	SH 563 698	Blending, Packing, Loading and Use of Bulk Cement	PG3/01	AR
ARF/EPA/01/93/PPC2	B	HANSON AGGREGATES PREMIX CONCRETE	Bangor Plant, Bangor, Gwynedd, LL574HN	SH 590 730	Blending, Packing, Loading and Use of Bulk Cement	PG3/01	AR
ARF/EPA/007/93PPC8	B	CEMEX UK MATERIALS LTD	Unit 34, Llandegai Industrial Estate, Llandegai, Bangor, Gwynedd, LL57	SH 593 711	Blending, Packing, Loading and Use of Bulk Cement	PG3/01	AR
ARF/PPC/20	B	NATIONAL WELSH FUELS LTD	Railway Goods Yard, Bangor, Gwynedd, LL57 2TX	SH 573 716	Storage, Unloading and Loading Petrol at Terminals	PG1/13	AR
ARF/EPA/015/93	B	DENIS FERRANTI METERS LTD.	Caernarfon Road, Bangor, Gwynedd, LL57 4SP	SH 569 708	Coating of Metal and Plastic	PG6/23	AR
ARF/EPA/001/01	B	GWYNEDD SKIP HIRE	Lon Hen Felin, Cibyn Industrial Estate, Caernarfon, Gwynedd, LL552BD	SH 470 529	Mobile Crushing Plant	PG3/08	AR
ARF/EPA/004/92	B	BANGOR CREMATORIUM	Amlosgfa Bangor, Ffordd Llandygai, Llandygai, Bangor, Gwynedd, LL57 4H	SH 592 716	Crematoria	PG5/2	AR
ARF/EPA/013/92	B (RF)	SILVER STAR SERVICES	3 Lon Cae Darby, Cibyn Industrial Estate, Caernarfon, Gwynedd, LL55 2B	SH 505 550	Waste Oil Burner Less Than 014MW Net Rated Thermal Input	PG1/1	AR
DWY/CEM/92/GLANB	B	PORTHMADOG CONCRETE LTD	Glan Byl, Criccieth, Gwynedd, LL52 0RD	SH 527 409	Blending, Packing, Loading and Use of Bulk Cement	PG3/01	DW
DWY/CEM/97/RHOSF	B	PORTHMADOG CONCRETE LTD	Rhosfawr, Pwllheli, Gwynedd, LL53 6NF	SH 380 396	Blending, Packing, Loading and Use of Bulk Cement	PG3/01	DW
DWY/VP43/842/LP/SEJ	B (RF)	BERWYN COACHES (B.&M.JAPHETH)	Berwyn Garage, Unit 1 Trefor Workshops, Treforrfon, Gwynedd,	SH 370 368	Waste Oil Burner Less Than 014MW	PG1/1	DW

			LL54 5LL		Net Rated Thermal Input		
MER/008/A	B	TARMAC QUARRY PRODUCTS	Minffordd, Penrhyndeudraeth, Gwynedd, LL48 6HP	SH 594 390	Quarry Process Including Road Stone Plant	PG3/08 & PG3/15a	ME
MER/PPC/508610	B	CONCRETE SARNAU LTD	Erw Feurig, Cefnddwysarn, Bala, Gwynedd, LL23 7LL	SH 967 390	Blending, Packing, Loading and Use of Bulk Cement	PG3/01	ME
MER/005/B	B	HANSON AGGREGATES PREMIX	Minffordd Quarry, Minffordd, Penrhyndeudraeth, Gwynedd, LL48 6HP	SH 593 390	Blending, Packing, Loading and Use of Bulk Cement	PG3/01	ME
MER/003/B	B	OMYA UK	Omya, Blaenau Ffestiniog, Gwynedd, LL41 3ND	SH 696 474	Quarry Process Including Road Stone Plant	PG3/08 & PG3/15a	ME
ARF/PPC/01/06	B (RF)	JOHNSONS THE CLEANERS	18 Stryd Y Llyn, Caernarfon, Gwynedd, LL55 2AB	SH 480 626	Dry Cleaning	PG6/4	AR
ARF/EPA/002/98/PPC/11	B (RF)	TEXACO GARTH SERVICE STATION	Beach Road, Bangor, Gwynedd, LL57 1AB	SH 585 729	Petrol Vapour	PG1/14	AR
ARF/EPA/005/98/PPC/14	B (RF)	GWALIA GARAGE (LONDIS)	Gwalia Garage, Caeathro, Caernarfon, Gwynedd, LL55 2SS	SH 503 615	Petrol Vapour	PG1/14	AR
ARF/EPA/007/98/PPC/16	B (RF)	BRYN LLWYD SERVICE STATION	Caernarfon Road, Bangor, Gwynedd, LL57 4SU	SH 566 703	Petrol Vapour	PG1/14	AR
ARF/PPC/002/09	B (RF)	TESCO FILLING STATION	Tesco Extra, Ffordd Caernarfon, Bangor, Gwynedd, LL57 4SU	SH 563 700	Petrol Vapour II	PG1/14 ?	AR
ARF/EPA/001/09/PPC/15	B (RF)	MORRISONS SERVICE STATION	Ffordd Y Gogledd, Caernarfon, Gwynedd, LL55 1BE	SH 482 632	Petrol Vapour II	PG1/14	AR
ARF/EPA/003/98/PPC/12	B (RF)	ESSO LLYS Y GWYNT BANGOR	Llys Y Gwynt Services, A5/A55 Llandegai Interchange, Bangor, Gwynedd,	SH 591 696	Petrol Vapour	PG1/14	AR
ARF/EPA/008/98/PPC17	B (RF)	CAER SERVICE STATION	Caer Service Station, Lôn Parc, Caernarfon, Gwynedd, LL55 2HP	SH 482 624	Petrol Vapour	PG1/14	AR
ARF/EPA/011/92	B (RF)	MODURDY DOLYDD GARAGE	Dolydd Garage, Y Groeslon, Caernarfon, Gwynedd, LL54 7EF	SH 475 571	Waste oil Burner Less Than 014MW Net Rated Thermal Input	PG1/1	AR
ARF/EPA/007/98/PPC/13	B (RF)	BERAN FILLING STATION	Deiniolen, Caernarfon, Gwynedd LL55 3NF	SH 570 647	Petrol Vapour	PG1/14	AR
M/PVR/98/ME	B (RF)	MILE END SERVICE STATION	A470 Lon Arran, Dolgellau, Gwynedd, LL40 2AB	SH 182 744	Petrol Vapour	PG1/14	ME
M/PVR/02/WP	B (RF)	W D PUGH & SON LTD	Bala Road, Dolgellau, Gwynedd, LL40 2YE	SH 729 180	Petrol Vapour	PG1/14	ME
M/PVR/02/HG	B (RF)	H G THOMAS MOTORS	Dyffryn Garage, Glan Yr Afon, Corwen, Gwynedd, LL21 0HA	SJ 026425	Petrol Vapour	PG1/14	ME
M/PVR/02/SO	B (RF)	SPAR OAK GARAGE	High Street, Tywyn, Gwynedd, LL36 9AD	SH 584 007	Petrol Vapour	PG1/14	ME

M/PVR/98/MB	B (RF)	MODURON Y BALA	West End Garage, Bala, Gwynedd, LL23 7AE	SH 358 924	Petrol Vapour	PG1/14	ME
M/PVR/98/PR	B (RF)	ALLAN GREEN	Park Road Garage, Penrhyndeudraeth, Gwynedd, LL48 6LS	SH 392 614	Petrol Vapour	PG1/14	ME
MER/010	B (RF)	Modurdy Lluest	Modurdy Lluest, Penrhyndeudraeth, Gwynedd, LL48 6AF	SH 612 389	Waste Oil Burner Less Than 014MW Net Rated Thermal Input	PG1/1	ME
MER/PVR/5060	B (RF)	SMITHY GARAGE	High Street, Dyffryn Ardudwuy LL44 2EN	SH 587 229	Petrol Vapour	PG1/14	ME
MER/PVR/6399	B (RF)	BEACON FILLING STATION	Ffordd Bryncrug, Tywyn LL36 9RT	SH 590 010	Petrol Vapour	PG1/14	ME
MEIR/PPC/01/06	B (RF)	CAMBRIAN CLEANERS LIMITED	Nant Road, Harlech, Gwynedd, LL46 2UE	SH 582 314	Dry Cleaning	PG6/4	ME
DWY/DC/06/LLYN	B (RF)	LLYN CLEANERS	83 Stryd Fawr, Pwllheli, Gwynedd, LL53 5RR	SH 374 352	Dry Cleaning	PG6/4	DW
DWY/PVR/98/PULROSE	B (RF)	PULROSE MOTOR SERVICES LTD	Ala Road, Pwllheli, Gwynedd, LL53 5TA		Petrol Vapour	PG1/14	DW
DWY/PVR/98/LLANBED	B (RF)	LLANBEDROG SERVICE STATION	Beach Road, Llanbedrog, Pwllheli, Gwynedd, LL53 7TN	SH 326 317	Petrol Vapour	PG1/14	DW
DWY/PVR/98/GLANDON	B (RF)	GLANDON FILLING STATION	Caernarfon Road, Pwllheli, Gwynedd, LL53 5LF	SH 377 355	Petrol Vapour	PG1/14	DW
DWY/PVR/02/MADOG	B (RF)	MADOG GARAGE	Criccieth Road, Porthmadog, Gwynedd, LL49 9NY	SH 506 382	Petrol Vapour	PG1/14	DW
DWY/PVR/98/SHELL	B (RF)	SHELL PORTHMADOG	High Street, Porthmadog, Gwynedd, LL49 9NG	SH 333 320	Petrol Vapour II	PG1/14	DW
DWY/PVR/98/PANDY	B (RF)	SQM JET POWER LTD	Pandy Garage, Chwilog, Pwllheli, Gwynedd, LL53 6SQ	SH 454 378	Petrol Vapour	PG1/14	DW
DWY/PVR/04/TESCO	B (RF)	TESCO FILLING STATION	Stryd Fawr, Porthmadog, Gwynedd, LL49 9NU	SH 566 389	Petrol Vapour II	PG1/14	DW
DWY/PVR/98/DOLWAR	B (RF)	DOLWAR SERVICE STATION	Y Ffor, Pwllheli, Gwynedd, LL53 6UR	SH 389 389	Petrol Vapour	PG1/14	DW

Appendix D: Nitrogen Dioxide prediction with distance from Site C2 at A487 Roundabout, Caernarfon.

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

-

Enter data into the yellow cells

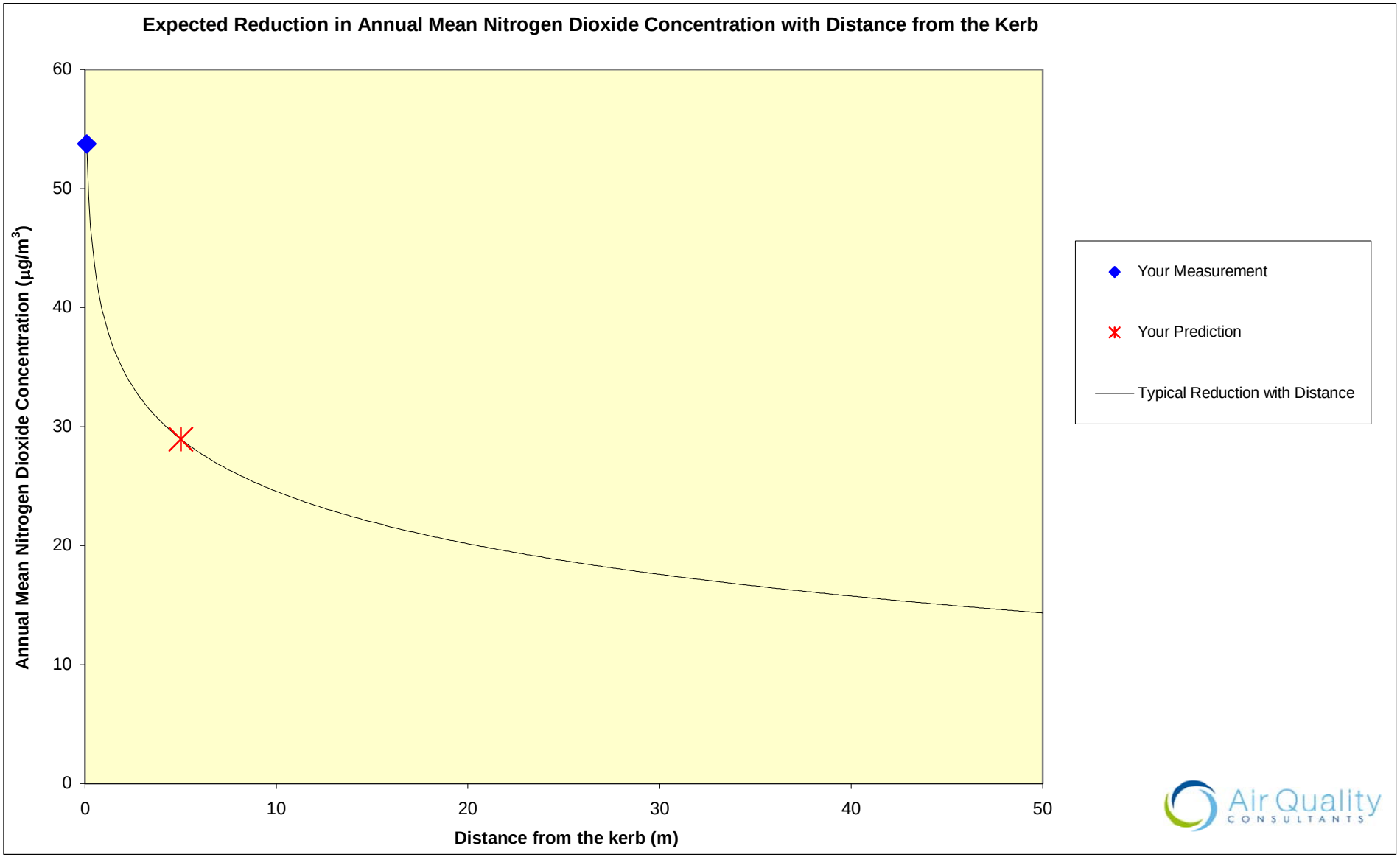
Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**0.1**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**5**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**7.682774**	$\mu g/m^3$
Step 4	**What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?**	(Note 2)	**53.76**	$\mu g/m^3$
Result	**The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor**	(Note 3)	**28.9**	$\mu g/m^3$

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 4: 25/01/11. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk


Expected Reduction in Annual Mean Nitrogen Dioxide Concentration with Distance from the Kerb
Annual Mean Nitrogen Dioxide Concentration (µg/m3)
60
50
40
30
20
10
0
0
10
20
30
40
50
Distance from the kerb (m)
Your Measurement
Your Prediction
Typical Reduction with Distance
Air Quality
CONSULTANTS

Appendix E: Nitrogen Dioxide prediction with distance from Site B4 at A55 Penrhosgarnedd.

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

-

Enter data into the yellow cells

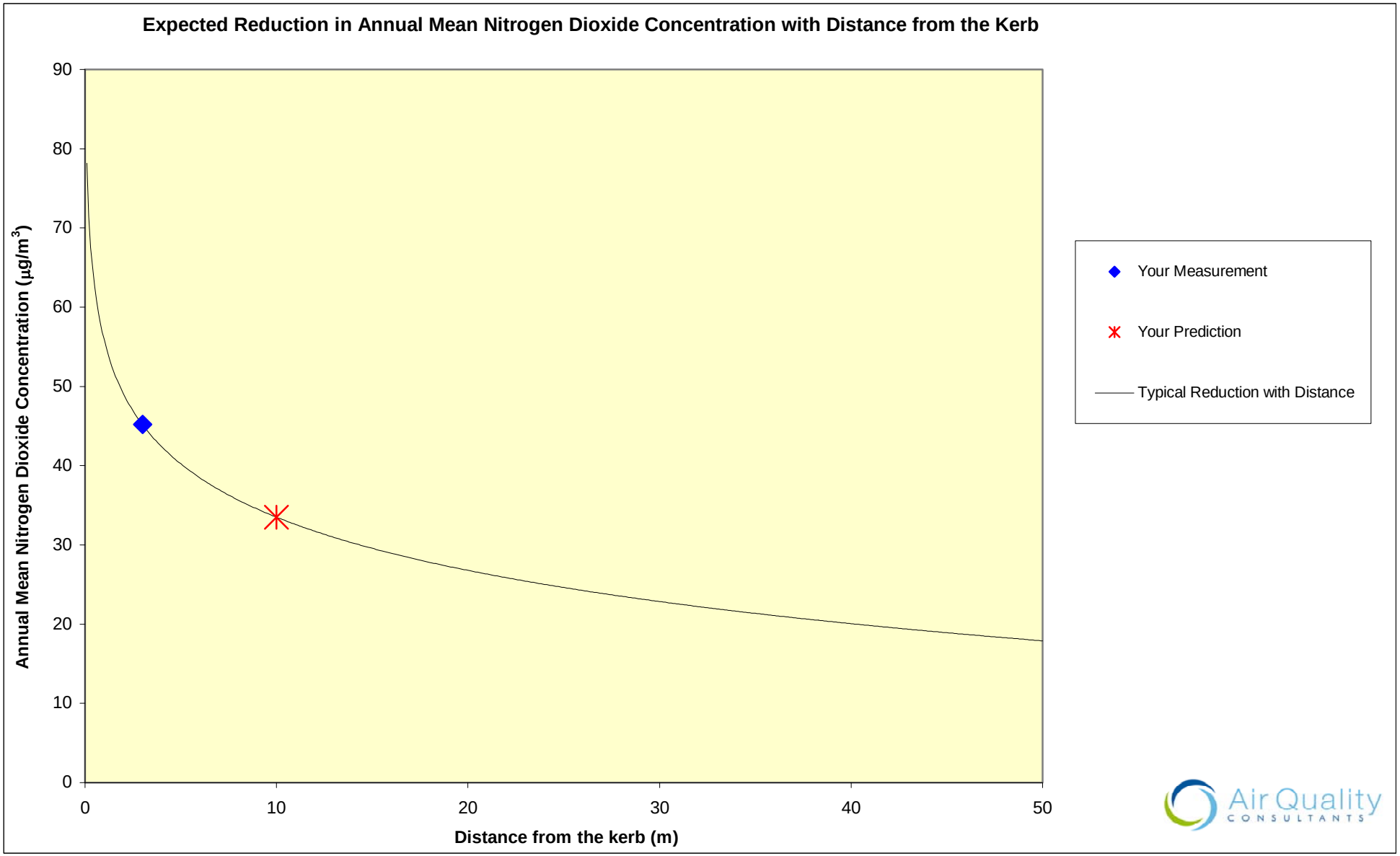
Step 1	**How far from the KERB was your measurement made (in metres)?**	(Note 1)	**3**	metres
Step 2	**How far from the KERB is your receptor (in metres)?**	(Note 1)	**10**	metres
Step 3	**What is the local annual mean background NO_2 concentration (in µg/m^3)?**	(Note 2)	**7.70939**	µg/m^3
Step 4	**What is your measured annual mean NO_2 concentration (in µg/m^3)?**	(Note 2)	**45.18**	µg/m^3
Result	**The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor**	(Note 3)	**33.5**	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 4: 25/01/11. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk


Expected Reduction in Annual Mean Nitrogen Dioxide Concentration with Distance from the Kerb
Annual Mean Nitrogen Dioxide Concentration (µg/m3)
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
Distance from the kerb (m)
Your Measurement
Your Prediction
Typical Reduction with Distance
Air Quality CONSULTANTS

Appendix F: Air Quality Predictions for A487 Porthmadog, Minffordd and Tremadog Bypass.

Construction

Table F1 summarises the results of local air quality screening assessment for sensitive receptors representing residential areas. Table F2 shows the equivalent results for the ecological receptors. All results include background concentrations taken from Table 7.3 of Chapter 7 of the Environmental Statement.

Table F1 Local air quality screening assessment results (construction)

Receptor	Year	Scenario	Annual Mean NO_2 (µg/m³)	Annual Mean PM10 (µg/m³)	Exceedences of 50 µg/m³ PM10 (days/yr)
Objective			40.0	40.0	35
1. 44 Adwy Ddu	2007	Base	3.68	14.37	0.00
	2010	DM	3.18	13.38	0.00
		DS	3.23	13.39	0.00
2. Bron y Garth Hospital	2007	Base	6.89	15.45	0.18
	2010	DM	5.80	14.15	0.00
		DS	6.20	14.25	0.00
3. Tremyane	2007	Base	3.81	14.39	0.00
	2010	DM	3.28	13.39	0.00
		DS	3.33	13.40	0.00
4. Rebecca Tollgate Cottage	2007	Base	8.37	15.84	0.27
	2010	DM	7.05	14.45	0.00
		DS	7.47	14.54	0.00
5. 1 Park Street	2007	Base	5.68	15.08	0.13
	2010	DM	4.81	13.90	0.00
		DS	5.03	13.95	0.00
6. 6 Osmond Lane	2007	Base	4.71	14.72	0.00
	2010	DM	4.02	13.64	0.00
		DS	4.04	13.64	0.00
7. 123 High Street	2007	Base	9.46	16.78	0.63
	2010	DM	7.95	15.12	0.14
		DS	8.06	15.16	0.14
8. Glen House	2007	Base	7.57	15.74	0.24
	2010	DM	6.36	14.38	0.00
		DS	6.46	14.40	0.00
9. 8 Railway Place	2007	Base	4.67	14.71	0.00
	2010	DM	4.00	13.63	0.00
		DS	4.14	13.66	0.00
10. 21 Meadow Drive	2007	Base	6.55	15.33	0.16
	2010	DM	5.54	14.08	0.00
		DS	5.77	14.14	0.00
11. Bodawen Nursing Home	2007	Base	3.45	14.31	0.00
	2010	DM	2.99	13.33	0.00
		DS	3.01	13.34	0.00
12. 49 Dublin Street	2007	Base	6.39	15.22	0.15
	2010	DM	5.39	13.99	0.00
		DS	5.37	13.98	0.00
13. 17 Sunnyside	2007	Base	3.68	14.36	0.00
	2010	DM	3.18	13.38	0.00
		DS	3.17	13.38	0.00
14. not used					
15. Bronturnor	2007	Base	3.58	14.34	0.00
	2010	DM	3.09	13.36	0.00
		DS	3.15	13.38	0.00
16. Erw Wen	2007	Base	3.27	14.26	0.00
	2010	DM	2.85	13.30	0.00
		DS	2.86	13.30	0.00
17. 6 Syenite Terrace	2007	Base	3.27	14.26	0.00
	2010	DM	2.85	13.30	0.00
		DS	2.85	13.30	0.00
18. Gwynfryn	2007	Base	3.27	14.26	0.00
	2010	DM	2.85	13.30	0.00
		DS	2.85	13.30	0.00
19. 13 Maes Gerddi	2007	Base	3.45	14.31	0.00
	2010	DM	2.99	13.34	0.00
		DS	3.03	13.34	0.00
20. 26 Isgraig	2007	Base	3.35	14.28	0.00
	2010	DM	2.91	13.32	0.00
		DS	2.93	13.32	0.00
21. Arfryn	2007	Base	6.15	15.13	0.14
	2010	DM	5.20	13.93	0.00
		DS	5.19	13.92	0.00
22. not used					

Table F2 Local air quality screening assessment results (ecological receptors)

Receptor	Year	Scenario	Annual Mean NOx (µg/m³)
Objective			30.0
23. Morfa Harlech SSSI (Pen Llŷn a'r Sarnau SAC): 50m from A487 (The Cob)	2007	Base	9.45
	2010	DM	7.92
		DS	8.42
24. Morfa Harlech SSSI (Pen Llŷn a'r Sarnau SAC): 150m from A487 (The Cob)	2007	Base	4.57
	2010	DM	4.06
		DS	4.11
25. Coed Tremadog SSSI/SAC/NNR: Nearest point to A487	2007	Base	6.20
	2010	DM	5.34
		DS	5.32
26. Glaslyn SSSI: 50m from proposed bypass	2007	Base	4.04
	2010	DM	3.64
		DS	3.69
27. Glaslyn SSSI: 150m from proposed bypass	2007	Base	4.04
	2010	DM	3.64
		DS	3.65
28. Traeth Glaslyn nature reserve: 50m from existing A487 (near Boston Lodge Cottages)	2007	Base	9.45
	2010	DM	7.92
		DS	8.42

Operation

Table F3 summarises the results of local air quality screening assessment for sensitive receptors representing residential areas. Table G4 shows the equivalent results for the ecological receptors. All results include background concentrations taken from Table 7.3 of Chapter 7 of this Environmental Statement.

Table F3 Local air quality screening assessment results

Receptor	Year	Scenario	Annual Mean NO_2 (µg/m³)	Annual Mean PM10 (µg/m³)	Exceedences of 50 µg/m³ PM10 (days/yr)
Objective			40.0	40.0	35
1. 44 Adwy Ddu	2007	Base	3.68	14.37	0.00
	2012	DM	3.05	13.16	0.00
		DS	3.06	13.16	0.00
	2027	DM	2.90	12.56	0.00
		DS	2.90	12.56	0.00
2. Bron y Garth Hospital	2007	Base	6.89	15.45	0.18
	2012	DM	5.45	13.84	0.00
		DS	5.59	13.88	0.00
	2027	DM	5.04	13.16	0.00
		DS	5.15	13.19	0.00
3. Tremyane	2007	Base	3.81	14.39	0.00
	2012	DM	3.18	13.18	0.00
		DS	2.80	13.10	0.00
	2027	DM	3.01	12.58	0.00
		DS	2.66	12.51	0.00
4. Rebecca Tollgate Cottage	2007	Base	8.37	15.84	0.27
	2012	DM	6.89	14.15	0.00
		DS	3.29	13.21	0.00
	2027	DM	6.31	13.42	0.00
		DS	3.18	12.63	0.00
5. 1 Park Street	2007	Base	5.68	15.08	0.13
	2012	DM	4.70	13.65	0.00
		DS	3.00	13.15	0.00
	2027	DM	4.36	12.98	0.00
		DS	2.88	12.57	0.00
6. 6 Osmond Lane	2007	Base	4.71	14.72	0.00
	2012	DM	3.80	13.38	0.00
		DS	3.25	13.22	0.00
	2027	DM	3.58	12.76	0.00
		DS	3.05	12.61	0.00
7. 123 High Street	2007	Base	9.46	16.78	0.63
	2012	DM	7.33	14.65	0.00
		DS	4.70	13.66	0.00
	2027	DM	6.79	13.89	0.00
		DS	4.24	12.98	0.00
8. Glen House	2007	Base	7.57	15.74	0.24
	2012	DM	6.01	14.04	0.00
		DS	5.00	13.69	0.00
	2027	DM	5.54	13.34	0.00
		DS	4.62	13.03	0.00
9. 8 Railway Place	2007	Base	4.67	14.71	0.00
	2012	DM	3.87	13.39	0.00
		DS	3.64	13.31	0.00
	2027	DM	3.58	12.77	0.00
		DS	3.36	12.69	0.00
10. 21 Meadow Drive	2007	Base	6.55	15.33	0.16
	2012	DM	5.14	13.75	0.00
		DS	5.45	13.81	0.00
	2027	DM	4.77	13.09	0.00
		DS	5.07	13.12	0.00
11. Bodawen Nursing Home	2007	Base	3.45	14.31	0.00
	2012	DM	2.88	13.12	0.00
		DS	3.08	13.16	0.00
	2027	DM	2.75	12.53	0.00
		DS	2.93	12.56	0.00
12. 49 Dublin Street	2007	Base	6.39	15.22	0.15
	2012	DM	5.06	13.68	0.00
		DS	4.54	13.54	0.00
	2027	DM	4.68	13.01	0.00
		DS	4.21	12.89	0.00
13. 17 Sunnyside	2007	Base	3.68	14.36	0.00
	2012	DM	3.05	13.15	0.00
		DS	2.98	13.14	0.00
	2027	DM	2.90	12.56	0.00
		DS	2.83	12.55	0.00
14. not used					
15. Bronturnor	2007	Base	3.58	14.34	0.00
	2012	DM	2.98	13.14	0.00
		DS	4.23	13.43	0.00
	2027	DM	2.83	12.55	0.00
		DS	3.92	12.80	0.00
16. Erw Wen	2007	Base	3.27	14.26	0.00
	2012	DM	2.76	13.09	0.00
		DS	3.14	13.17	0.00
	2027	DM	2.64	12.50	0.00
		DS	2.97	12.57	0.00
17. 6 Syenite Terrace	2007	Base	3.27	14.26	0.00
	2012	DM	2.76	13.09	0.00
		DS	2.90	13.12	0.00
	2027	DM	2.64	12.50	0.00
		DS	2.76	12.53	0.00
18. Gwynfryn	2007	Base	3.27	14.26	0.00
	2012	DM	2.76	13.09	0.00
		DS	3.04	13.15	0.00
	2027	DM	2.64	12.50	0.00
		DS	2.88	12.55	0.00
19. 13 Maes Gerddi	2007	Base	3.45	14.31	0.00
	2012	DM	2.88	13.12	0.00
		DS	2.94	13.13	0.00
	2027	DM	2.75	12.53	0.00
		DS	2.81	12.54	0.00
20. 26 Isgraig	2007	Base	3.35	14.28	0.00
	2012	DM	2.81	13.10	0.00
		DS	3.21	13.18	0.00
	2027	DM	2.69	12.51	0.00
		DS	3.04	12.59	0.00
21. Arfryn	2007	Base	6.15	15.13	0.14
	2012	DM	4.89	13.63	0.00
		DS	4.60	13.55	0.00
	2027	DM	4.53	12.97	0.00
		DS	4.27	12.90	0.00
22. not used					

Table F4 Local air quality screening assessment results (ecological receptors)

Receptor	Year	Scenario	Annual Mean NOx (µg/m³)
Objective			30.0
23. Morfa Harlech SSSI (Pen Llŷn a'r Sarnau SAC): 50m from A487 (The Cob)	2007	Base	9.45
	2012	DM	7.62
		DS	3.87
	2027	DM	6.74
		DS	3.56
24. Morfa Harlech SSSI (Pen Llŷn a'r Sarnau SAC): 150m from A487 (The Cob)	2007	Base	4.57
	2012	DM	3.85
		DS	3.48
	2027	DM	3.47
		DS	3.16
25. Coed Tremadog SSSI/SAC/NNR: Nearest point to A487	2007	Base	6.20
	2012	DM	4.94
		DS	4.60
	2027	DM	4.41
		DS	4.11
26. Glaslyn SSSI: 50m from proposed bypass	2007	Base	4.04
	2012	DM	3.44
		DS	7.23
	2027	DM	3.11
		DS	6.35
27. Glaslyn SSSI: 150m from proposed bypass	2007	Base	4.04
	2012	DM	3.44
		DS	3.81
	2027	DM	3.11
		DS	3.43
28. Traeth Glaslyn nature reserve: 50m from existing A487 (near Boston Lodge Cottages)	2007	Base	9.45
	2012	DM	7.62
		DS	3.87
	2027	DM	6.74
		DS	3.56

Table F5: Local air quality screening assessment results (nitrogen deposition in alluvial woodland at Glaslyn SSSI)

Receptor	Year	Scenario	Nitrogen deposition (kg N/ha/yr)
Critical Load			10 – 15
50m from road centre	2007	Base	20.0
	2012	DM	17.9
		DS	18.05
	2027	DM	11.5
		DS	11.63
150m from road centre	2007	Base	20.0
	2012	DM	17.9
		DS	17.92
	2027	DM	11.5
		DS	11.51