

Welsh Government

**M4 Corridor around Newport**

**Environmental Statement:**

**Volume 3**

**Appendix 7.1 Operational  
Assessment Methodology**

M4CaN-DJV-EAQ-ZG-GEN\_AX-EN-0001

At Issue | March 2016

# Contents

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	Page
<b>1</b>	<b>Appendix 7.1 – Operational Assessment Methodology</b> <b>1</b>
1.1	Human Health Receptors 1
1.2	Ecological Receptors 2
1.3	Meteorological Data 5
1.4	Model Verification 7

# 1 Appendix 7.1 – Operational Assessment Methodology

## 1.1 Human Health Receptors

1.1.1 Human health receptors have been selected across the affected road network to determine the effect of the Scheme on local air quality.

**Table 7.1.1 Human Health Receptors**

ID	Location	Easting	Northing
HH1	Pant-rhiw-goch	324357	183868
HH2	Channel View	325729	183974
HH3	Homeview	326409	184103
HH4	Longhouse	326696	184097
HH5	Berry Hill Farm	326868	184273
HH6	Cefn Road	327383	188558
HH7	Forge Road	328038	186353
HH8	Pencarn Avenue	328293	184919
HH9	162 Bassaleg Road	328540	187008
HH10	158 Bassaleg Road	328587	187009
HH11	Maesglas Close	329858	185668
HH12	Lighthouse Road	330020	183694
HH13	Fair Orchard Farm	330115	183890
HH14	179 Malpas Road	330507	189664
HH15	153 Malpas Road	330564	189617
HH16	Chruch Road	331530	188535
HH17	Alexandra Road	331535	186222
HH18	Stockton Road	331975	189938
HH19	Caerleon Road	332041	189058
HH20	41 Denbigh Road	332295	189715
HH21	40 Denbigh Road	332323	189701
HH22	Caerleon Road North of J25	332354	189834
HH23	St Julians School	332433	189605
HH24	Chepstow Road	332546	188301
HH25	Eveswell Primary School	332637	188304
HH26	Goya Close	333086	189317
HH27	Spytty Lane	333296	186752
HH28	Coleg Gwent	334032	186508
HH29	Christchurch Road	334216	188889
HH30	Pye Corner Farm	334527	185173
HH31	Malcolm Sargeant Close	334728	187719
HH32	Buckland Cottage	334934	189235
HH33	Tatton Farm	335239	185781
HH34	Mountbatten Close	335959	188959
HH35	Chepstow Road	336808	189804
HH36	Old Langstone Court Road	336830	189619
HH37	Greenmoor Farm	340026	185707
HH38	Magor Road	340167	188874
HH39	Llandevenny	341175	186754
HH40	Barecroft Common	341790	186925
HH41	Green Moor Lane	341830	187087
HH42	Blenheim Gardens	341991	187325

ID	Location	Easting	Northing
HH43	Queens Gardens	342095	187536
HH44	Newport Road	342158	187617
HH45	Langley Close	342278	187696
HH46	Grange Road	342983	187775
HH47	Knollbury	343077	188032
HH48	Rockfield Grove	343839	187420
HH49	Court Farm	345065	187843
HH50	Caldicot Road 1	345105	187975
HH51	Caldicot Road 2	345170	187925
HH52	Caldicot Road 3	345599	187989

## 1.2 Ecological Receptors

1.2.1 As required by DMRB, receptors transects have been assessed at designated sites within 200 metres of the affected road network.

**Table 7.1.2 Ecological Receptors**

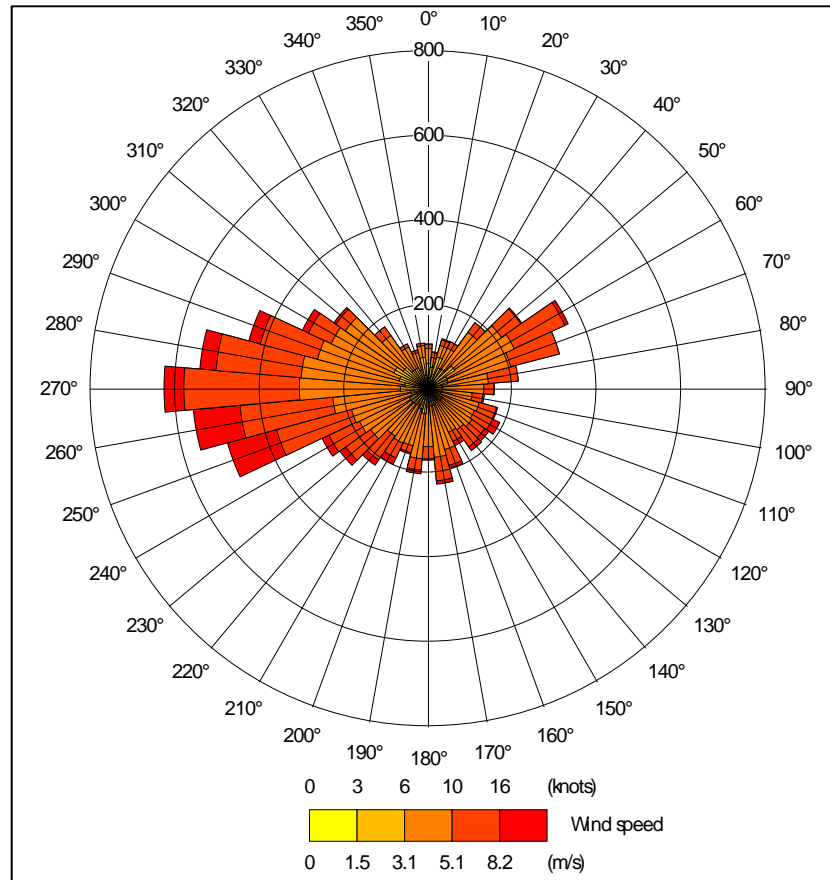
ID	Designated Site	Easting	Northing	Distance to nearest road	Road
Eco1	Fforestganol A Chwm Nofydd - A	315276	182480	161	Existing M4
Eco2	Fforestganol A Chwm Nofydd - B	315270	182532	212	Existing M4
Eco3	St Brides North - A	328482	183515	17	Scheme
Eco4	St Brides North - B	328485	183560	62	Scheme
Eco5	St Brides North - C	328485	183608	110	Scheme
Eco6	St Brides North - D	328486	183659	160	Scheme
Eco7	St Brides South - A	328482	183466	18	Scheme
Eco8	St Brides South - B	328484	183415	68	Scheme
Eco9	St Brides South - C	328486	183363	120	Scheme
Eco10	St Brides South - D	328486	183311	172	Scheme
Eco11	River Usk North - A	332140	185412	8	Scheme
Eco12	River Usk North - B	332099	185442	47	Scheme
Eco13	River Usk North - C	332064	185470	82	Scheme
Eco14	River Usk North - D	332026	185503	122	Scheme
Eco15	River Usk North - E	331956	185565	198	Scheme
Eco16	River Usk South - A	332184	185390	9	Scheme
Eco17	River Usk South - B	332220	185363	42	Scheme
Eco18	River Usk South - C	332263	185334	80	Scheme
Eco19	River Usk South - D	332307	185306	118	Scheme
Eco20	River Usk South - E	332404	185244	200	Scheme
Eco21	Nash & Goldcliff North - A	335549	185728	19	Scheme
Eco22	Nash & Goldcliff North - B	335541	185777	68	Scheme
Eco23	Nash & Goldcliff North - C	335533	185826	117	Scheme
Eco24	Nash & Goldcliff North - D	335525	185866	158	Scheme
Eco25	Nash & Goldcliff North - E	335519	185907	199	Scheme
Eco26	Nash & Goldcliff South - A	335562	185679	19	Scheme
Eco27	Nash & Goldcliff South - B	335575	185630	69	Scheme
Eco28	Nash & Goldcliff South - C	335588	185580	121	Scheme
Eco29	Nash & Goldcliff South - D	335601	185530	172	Scheme
Eco30	Nash & Goldcliff South - E	335608	185503	200	Scheme

ID	Designated Site	Easting	Northing	Distance to nearest road	Road
Eco31	Whitson North - A	338929	185667	17	Scheme
Eco32	Whitson North - B	338926	185713	64	Scheme
Eco33	Whitson North - C	338924	185764	114	Scheme
Eco34	Whitson North - E	338916	185848	199	Scheme
Eco35	Whitson North - D	338921	185812	163	Scheme
Eco36	Whitson South - A	338935	185613	22	Scheme
Eco37	Whitson South - B	338941	185561	74	Scheme
Eco38	Whitson South - C	338949	185509	127	Scheme
Eco39	Whitson South - D	338957	185457	179	Scheme
Eco40	Whitson South - E	338968	185408	229	Scheme
Eco41	Llanmartin Meadows - A	338520	189453	16	Existing M4
Eco42	Llanmartin Meadows - B	338530	189498	61	Existing M4
Eco43	Llanmartin Meadows - C	338536	189547	111	Existing M4
Eco44	Llanmartin Meadows - D	338543	189598	163	Existing M4
Eco45	Llanmartin Meadows - E	338548	189635	200	Existing M4
Eco46	Redwick and Llandeenny - A	340004	185870	19	Scheme
Eco47	Redwick and Llandeenny - B	339996	185918	68	Scheme
Eco48	Redwick and Llandeenny - C	339989	185965	81	Scheme
Eco49	Redwick and Llandeenny - D	339983	186016	31	A4810 Queens Way
Eco50	Redwick and Llandeenny - E	339981	186066	20	A4810 Queens Way
Eco51	Redwick and Llandeenny South - A	340096	185843	17	Scheme
Eco52	Redwick and Llandeenny South - B	340110	185792	70	Scheme
Eco53	Redwick and Llandeenny South - C	340127	185745	119	Scheme
Eco54	Redwick and Llandeenny South - D	340144	185693	175	Scheme
Eco55	Redwick and Llandeenny South - E	340156	185653	216	Scheme
Eco56	Magor and Undy - A	343242	186857	39	B4245 Main Road
Eco57	Magor and Undy - B	343246	186807	89	B4245 Main Road
Eco58	Magor and Undy - C	343250	186752	144	B4245 Main Road
Eco59	Magor and Undy - D	343255	186695	202	B4245 Main Road
Eco60	Nedern Brook Wetlands North - A	348226	189625	7	M48
Eco61	Nedern Brook Wetlands North - B	348212	189674	58	M48
Eco62	Nedern Brook Wetlands North - C	348202	189720	106	M48
Eco63	Nedern Brook Wetlands North - D	348190	189768	155	M48
Eco64	Nedern Brook Wetlands North - E	348178	189811	199	M48
Eco65	Nedern Brook Wetlands	348430	189630	12	M48

ID	Designated Site	Easting	Northing	Distance to nearest road	Road
	South - A				
Eco66	Nedern Brook Wetlands South - B	348445	189583	62	M48
Eco67	Nedern Brook Wetlands South - C	348456	189533	112	M48
Eco68	Nedern Brook Wetlands South - D	348466	189487	159	M48
Eco69	Nedern Brook Wetlands South - E	348475	189448	200	M48
Eco70	Severn Estuary North - A	350239	186980	21	M4
Eco71	Severn Estuary North - B	350261	187021	68	M4
Eco72	Severn Estuary North - C	350286	187064	117	M4
Eco73	Severn Estuary North - D	350300	187108	163	M4
Eco74	Severn Estuary North - E	350315	187143	201	M4
Eco75	Severn Estuary South - A	350219	186943	9	M4
Eco76	Severn Estuary South - B	350192	186902	58	M4
Eco77	Severn Estuary South - C	350163	186862	106	M4
Eco78	Severn Estuary South - D	350139	186819	154	M4
Eco79	Severn Estuary South - E	350111	186782	199	M4
Eco80	River Wye - A	354261	191272	11	M48
Eco81	River Wye - B	354289	191312	60	M48
Eco82	River Wye - C	354318	191348	106	M48
Eco83	River Wye - D	354352	191386	156	M48
Eco84	River Wye - E	354380	191420	200	M48

## 1.3 Meteorological Data

Diagram 7.1: Wind Rose from Rhoose Airport Meteorological Station, 2014



**1.3.1** Sensitivity testing has been undertaken for those human health receptors reported in the ES. Modelling has been undertaken using data from Filton meteorological station for 2014. As shown in Diagram 7.2, the wind rose from Filton meteorological station is similar to that at Rhoose with predominantly westerly winds.

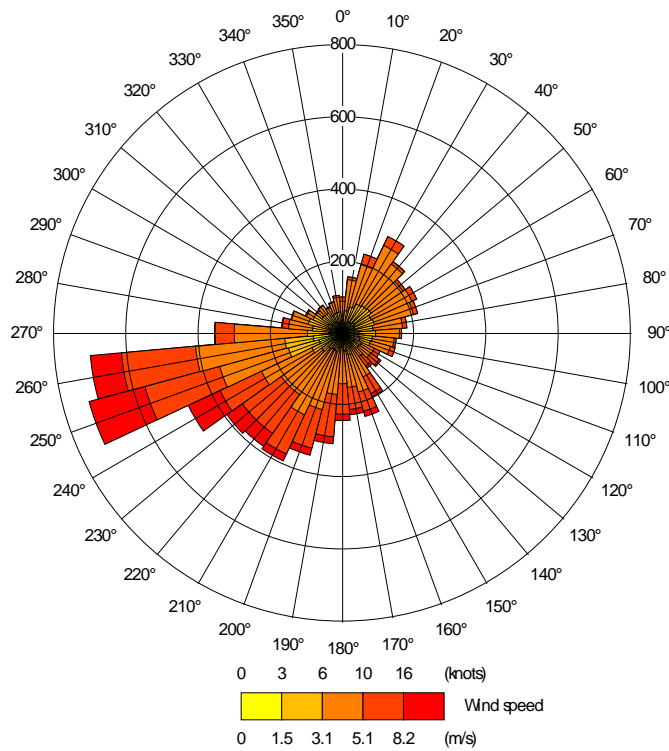
**Table 7.1.3: Sensitivity Testing of Meteorological Data**

Receptor ID	Location	Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> )				Difference in Do Something Concentrations
		Rhoose Meteorological Data		Filton Meteorological Data		
		DM 2022	DS 2022	DM 2022	DS 2022	
HH1	Pant-rhiw-goch	17.1	17.2	18.0	18.1	0.9
HH2	Channel View	17.3	17.5	18.2	18.5	0.9
HH3	Homeview	18.9	19.4	20.0	20.6	1.2
HH4	Longhouse	15.1	15.6	15.7	16.2	0.6
HH5	Berry Hill Farm	17.4	17.5	18.4	18.5	1.0
HH6	Cefn Road	17.8	17.7	18.5	18.3	0.6
HH7	Forge Road	19.6	19.4	21.1	20.9	1.5
HH8	Pencarn Avenue	20.8	20.6	21.2	21.0	0.4
HH9	162 Bassaleg Road	27.1	23.7	29.3	25.5	1.7
HH10	158 Bassaleg Road	32.4	27.4	34.8	29.1	1.8
HH11	Maesglas Close	21.9	21.5	22.7	22.2	0.7
HH12	Lighthouse Road	12.4	13.0	12.5	13.1	0.2
HH13	Fair Orchard Farm	12.4	13.8	12.5	14.1	0.3
HH14	179 Malpas Road	24.9	22.7	26.6	24.0	1.4
HH15	153 Malpas Road	30.6	26.8	33.2	28.8	2.0
HH16	Chruch Road	30.0	28.4	31.9	30.1	1.7
HH17	Alexandra Road	20.0	19.7	20.7	20.4	0.7
HH18	Stockton Road	27.1	25.0	28.6	26.2	1.2
HH19	Caerleon Road	27.5	26.5	29.6	28.5	2.0
HH20	41 Denbigh Road	32.4	29.9	34.5	31.4	1.4
HH21	40 Denbigh Road	33.3	30.7	35.2	32.0	1.3
HH22	Caerleon Road North of J25	25.3	24.7	26.7	26.1	1.4
HH23	St Julians School	22.0	20.4	23.0	21.1	0.7
HH24	Chepstow Road	26.8	26.2	28.5	27.7	1.5
HH25	Eveswell Primary School	22.6	22.2	23.9	23.4	1.2
HH26	Goya Close	26.9	23.1	28.4	24.1	1.0
HH27	Spytty Lane	19.3	18.9	20.1	19.7	0.8
HH28	Coleg Gwent	22.7	22.7	22.9	23.0	0.3
HH29	Christchurch Road	29.3	24.4	31.1	25.6	1.2
HH30	Pye Corner Farm	12.8	13.8	12.9	14.0	0.2
HH31	Malcolm Sargeant Close	20.6	20.4	21.0	20.7	0.4
HH32	Buckland	31.7	25.2	34.6	26.9	1.7



Receptor ID	Location	Annual Mean NO <sub>2</sub> Concentrations (µg/m <sup>3</sup> )				Difference in Do Something Concentrations
		Rhoose Meteorological Data		Filton Meteorological Data		
		DM 2022	DS 2022	DM 2022	DS 2022	
	Cottage					
HH33	Tatton Farm	10.9	11.6	11.1	11.9	0.3
HH34	Mountbatten Close	17.3	16.8	18.2	17.6	0.8

**Diagram 7.2: Wind Rose from Filton Airport Meteorological Station, 2014**



## 1.4 Model Verification

**1.4.1** Model verification has been undertaken by comparing modelled concentrations at 34 locations where monitored concentrations are available.

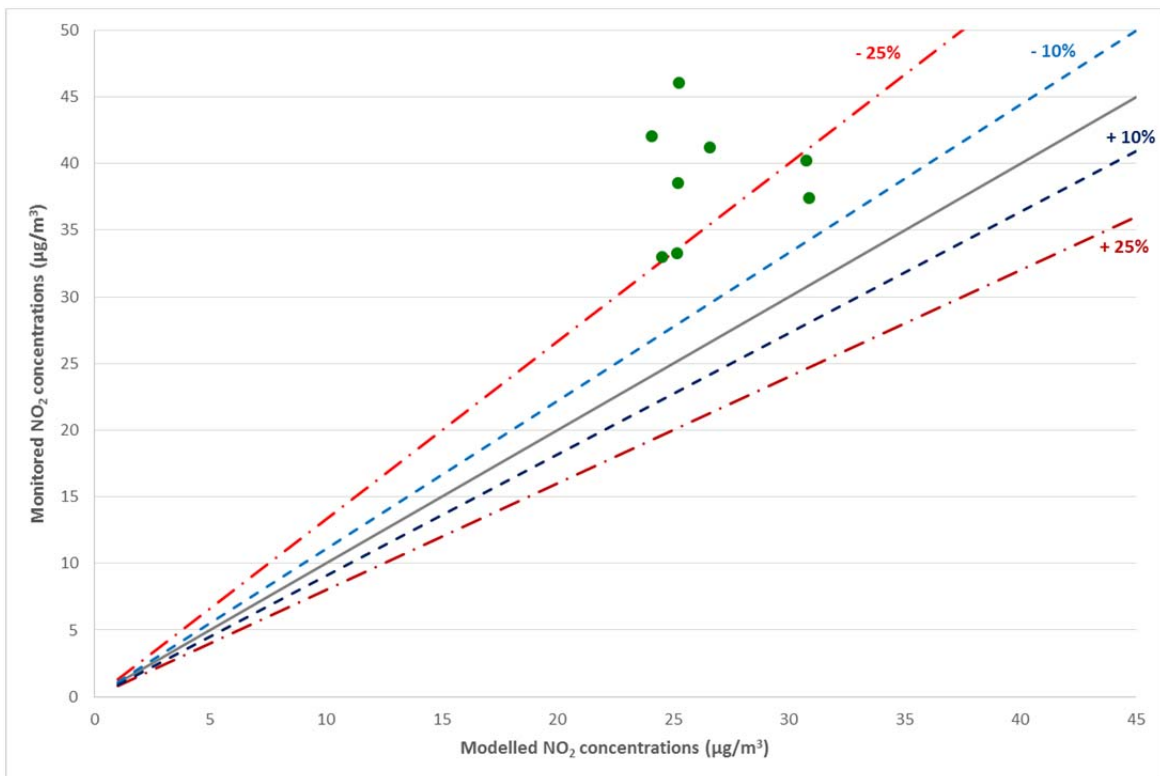
**Table 7.1.4: Monitoring locations used for verification**

Site	Location	Easting	Northing
8	No.6 Langley Close	342281	187678
12	Newport Stadium	333512	186638
14	Spytty Lane	333496	186702
16	Brunel Street	331608	186279
17	Holiday Inn Express 1	328302	185072
18	Holiday Inn Express 2	328270	185072
19	Berry Hill Farm	326901	184301
20	A48, Berry Hill Farm	326840	184301
22	Malpas Depot	330508	189696
24	Lamppost Badminton Road	332707	189615
NCC2	69 Glasllwch Crescent	328333	187869
NCC4	71 Glasllwch Crescent	328334	187884
NCC6	153 Malpas Road	330564	189617
NCC7	Glasllwch Lane	328366	187323
NCC9	182 Corporation Road	332069	187956
NCC11	169 Caerleon Road	332064	189102
NCC14	48 Malpas Road	330834	189310
NCC15	Glasllwch Crescent	328443	187809
NCC16	40 Denbigh Road	332320	189703
NCC17	179 Malpas Road	330507	189664
NCC18	Bassaleg Road 158/3	328598	186991
NCC19	177 Malpas Road	330510	189675
NCC20	222 Corporation Road	332173	187882
NCC21	M4 Junction 25 1	332684	189612
NCC23	M4 Junction 25 2	332684	189612
NCC24	Caerleon Road (swift)	331563	188548
NCC28	155 Caerleon Road	332046	189068
NCC31	Buckland Cottage, Royal Oak	334944	189240
NCC33	162 Bassaleg Road	328539	186986
NCC40	158 Bassaleg Road	328590	186992
NCC41	Bassaleg Road 162/3	328544	186975
NCC46	148 Chepstow Road	332285	188340
NCC50	9 Caerleon Road (Tatto)	331529	188535
CM1	M4 Junction 25A	332685	189613

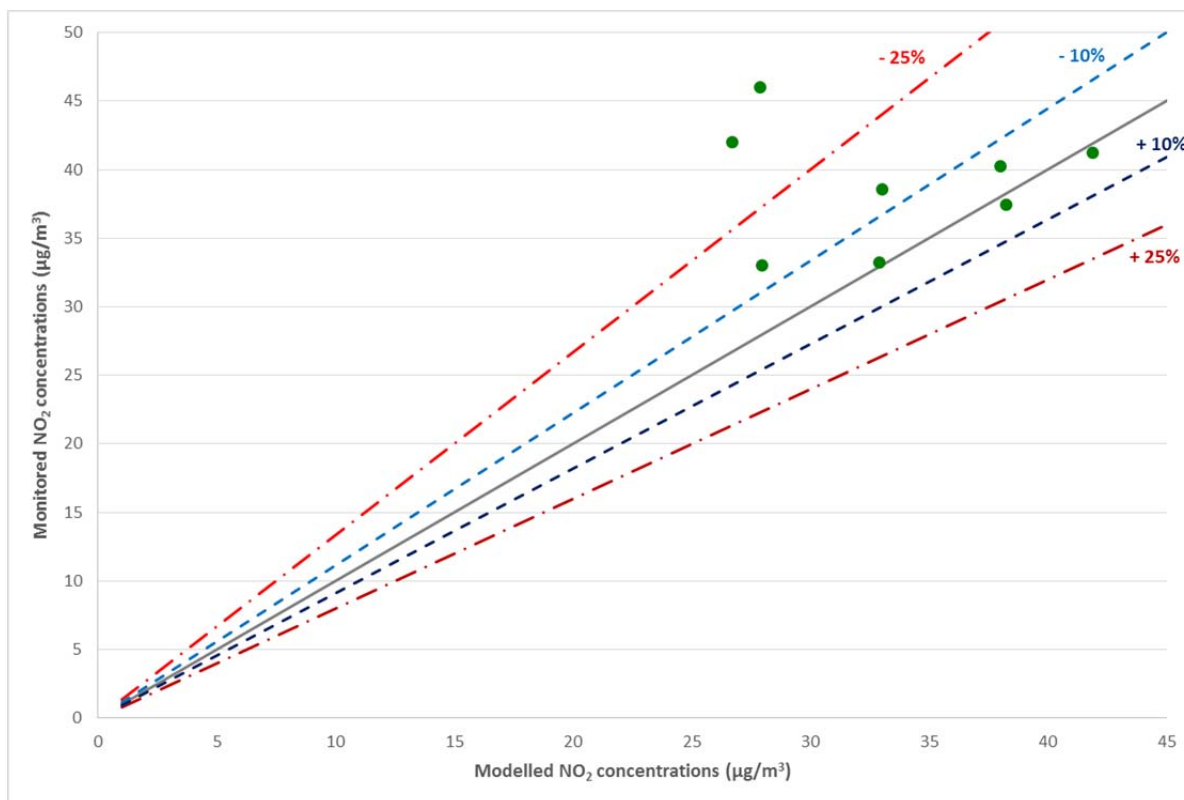
**Table 7.1.5: Verification Details for Newport City Centre**

Site	Monitored road NOx contribution ( $\mu\text{g}/\text{m}^3$ )	Modelled road NOx contribution ( $\mu\text{g}/\text{m}^3$ )	Ratio of monitored road Nox/modelled road Nox	Adjusted modelled road NOx contribution ( $\mu\text{g}/\text{m}^3$ )	Adjusted modelled total NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	Monitored total NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	% Difference NO <sub>2</sub> [(Modelled-monitored)/monitored]
169 Caerleon Road	17.8	7.8	2.3	24.2	32.9	33.3	-1%
48 Malpas Road	37.0	16.7	2.2	52.0	41.9	41.2	2%
Caerleon Road (swift)	27.6	7.5	3.7	23.3	38.0	40.3	-6%
155 Caerleon Road	29.7	7.9	3.8	24.5	33.0	38.6	-14%
9 Caerleon Road (Tatto)	21.1	7.7	2.7	23.9	38.2	37.5	2%
222 Corporation Road	44.6	2.5	17.8	7.8	26.7	42.1	-37%
182 Corporation Road	23.4	3.3	7.0	10.4	27.9	33.0	-15%
148 Chepstow Road	52.8	2.5	21.0	7.8	27.9	46.1	-40%
<b>Adjustment Factor</b>				<b>3.11</b>			

**Diagram 7.3 Graph comparing unadjusted NO2 concentrations**



**Diagram 7.4 Graph comparing adjusted NO2 concentrations**

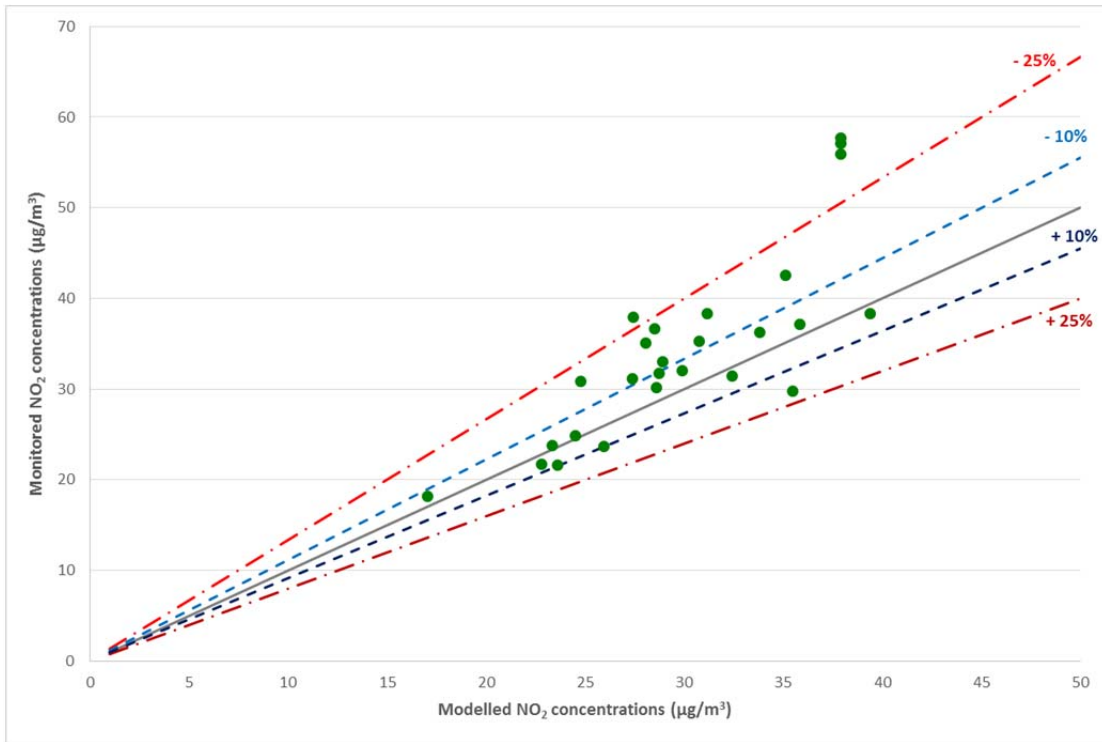


**Table 7.1.6 Verification Details for the Scheme Wide Study Area**

Site	Monitored road NOx contribution (µg/m <sup>3</sup> )	Modelled road NOx contribution (µg/m <sup>3</sup> )	Ratio of monitored road NOx/ modelled road NOx	Adjusted modelled road NOx contribution (µg/m <sup>3</sup> )	Adjusted modelled total NO <sub>2</sub> (µg/m <sup>3</sup> )	Monitored total NO <sub>2</sub> (µg/m <sup>3</sup> )	% Difference NO <sub>2</sub> (Modelled-monitored)/monitored)
No.6 Langley Close	2.1	5.4	0.4	6.3	17.5	18.2	-4%
Newport Stadium	8.3	8.7	1.0	10.2	24.1	23.8	1%
Spytty Lane	23.9	17.1	1.4	20.0	28.8	31.2	-8%
Brunel Street	6.6	7.0	0.9	8.2	25.1	24.9	1%
Holiday Inn Express 1	-1.9	11.5	-0.2	13.5	26.9	23.7	13%
Holiday Inn Express 2	-6.0	6.7	-0.9	7.8	24.1	21.6	12%
Berry Hill Farm	-3.5	11.3	-0.3	13.3	23.7	21.7	9%
A48, Berry Hill Farm	13.7	23.5	0.6	27.5	30.4	30.2	1%
Malpas Depot	13.5	13.0	1.0	15.2	25.8	30.9	-16%
Lamppost Badminton Road	24.6	26.3	0.9	30.7	35.8	36.3	-2%

Site	Monitored road NOx contribution ( $\mu\text{g}/\text{m}^3$ )	Modelled road NOx contribution ( $\mu\text{g}/\text{m}^3$ )	Ratio of monitored road NOx/ modelled road NOx	Adjusted modelled road NOx contribution ( $\mu\text{g}/\text{m}^3$ )	Adjusted modelled total NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	Monitored total NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	% Difference NO <sub>2</sub> (Modelled-monitored)/monitored)
69 Glasllwch Crescent	29.9	20.9	1.4	24.4	30.1	36.7	-18%
71 Glasllwch Crescent	19.0	21.4	0.9	25.0	30.4	31.8	-4%
153 Malpas Road	27.5	37.2	0.7	43.6	38.5	37.2	3%
Glasllwch Lane	26.3	20.0	1.3	23.4	29.6	35.1	-16%
Glasllwch Crescent	18.2	29.5	0.6	34.5	34.6	31.4	10%
40 Denbigh Road	29.2	39.3	0.7	45.9	42.1	38.3	10%
179 Malpas Road	16.2	23.8	0.7	27.9	31.7	32.1	-1%
Bassaleg Road 158/3	35.7	30.0	1.2	35.1	33.4	38.3	-13%
177 Malpas Road	29.3	18.6	1.6	21.7	28.9	38.0	-24%
M4 Junction 25 1	80.4	35.7	2.3	41.7	40.4	57.8	-30%
M4 Junction 25 2	78.5	35.7	2.2	41.7	40.4	57.1	-29%
Buckland Cottage, Royal Oak	48.2	33.9	1.4	39.6	37.6	42.6	-12%
162 Bassaleg Road	23.6	25.0	0.9	29.3	30.8	33.0	-7%
158 Bassaleg Road	16.7	39.9	0.4	46.7	38.3	29.8	28%
Bassaleg Road 162/3	28.6	29.1	1.0	34.0	32.9	35.3	-7%
M4 J25A CM	78.0	35.7	2.2	41.7	40.4	56.0	-28%
<b>Adjustment Factor</b>							<b>1.17</b>

**Diagram 7.5 Graph comparing unadjusted NO2 Concentrations**



**Diagram 7.6 Graph comparing adjusted NO2 Concentrations**

