



Department
for Environment
Food & Rural Affairs

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Report on measures for 2013 exceedance of the Target Value for Nickel in Swansea Urban Area agglomeration zone (UK0027)

November 2015



Llywodraeth Cymru
Welsh Government

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1. Introduction

1.1 Context

Under the EU Directive 2004/107/EC¹, the target value for nickel (Ni) is an annual mean concentration of 20 nanograms (one billionth of a gram (10^{-9})) per cubic metre (m^{-3}) of ambient air or lower. The Directive requires that a report is produced on measures in place to address any exceedance of this target value and that all reasonable measures that do not entail disproportionate cost should be taken to ensure this target is not exceeded.

1.2 Status of zone

This is the report on measures required for exceedances of the target value for Ni within the Swansea Urban Area agglomeration zone identified within the 2013 UK air quality assessment. Exceedances within this zone were identified on the basis of measurement data, with model results on a 1 km x 1 km grid resolution providing supplementary information. Fine scale modelling on a 20 m x 20 m grid resolution located around an identified industrial source provided additional supplementary information. This exceedance was reported via e-Reporting dataflow G² on attainment and Air Pollution in the UK³.

Table 1 summarises the spatial extent and associated resident population for the exceedances identified in this zone, as reported via e-Reporting.

Table 1. Area exceeding Ni target value in 2013 and associated resident population for exceeding areas within Swansea Urban Area zone UK0027.

Zone code	Zone Name	Area exceeding TV (km^2)	Population exceeding TV
UK0027	Swansea Urban Area	1	2,102

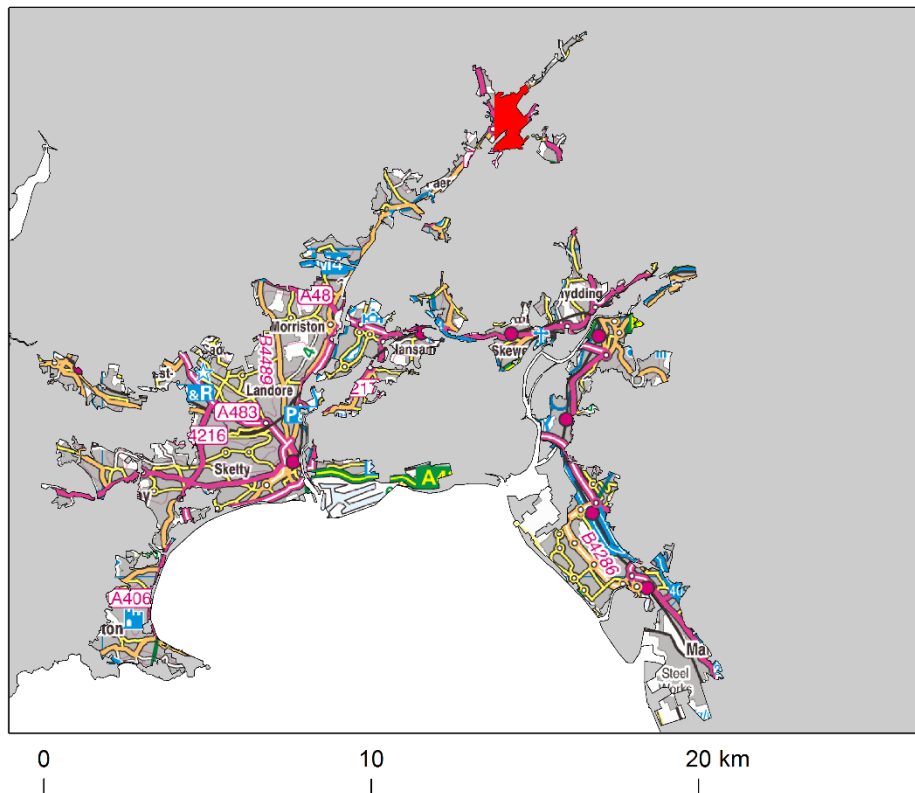
Figure 1 shows the locations of the exceedances in the context of the zone as a whole.

¹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF>

² <http://cdr.eionet.europa.eu/gb/eu/aqd>

³ <http://uk-air.defra.gov.uk/library/annualreport/index>

Figure 1. Location of exceedance of the Ni target value on 2013 in Swansea Urban Area zone UK0027. Exceeding areas are marked red.



An initial source apportionment was carried out and this analysis identified one exceedance situation within this zone related to industrial emissions:

- Swansea [Ni_UK0027_2013_1] related to industrial emissions (area of exceedance 1 km²)

This report describes the exceedance situation in the zone. The sections below include a description of the exceedance situation, including maps, information on source apportionment and a list of measures already taken or to be taken. Information on measures is reported within e-Reporting dataflow K⁴. This exceedance situation is adjacent to and shares common sources with the exceedance situation South Wales [Ni_UK0041_2013_1] for which further information can be found in the report on measures for South Wales UK0041.

⁴ <http://cdr.eionet.europa.eu/gb/eu/aqd>

2 Exceedance situation Swansea [Ni_UK0027_2013_1] related to industrial emissions

2.1 Description of exceedance

This exceedance situation has an area of exceedance of 1 km² and is located in the Swansea valley in the north of the Swansea Urban Area agglomeration zone. The resident population associated with this exceedance situation is 2,102. This exceedance situation is adjacent to and shares common sources with the exceedance situation South Wales [Ni_UK0041_2013_1].

Table 2 lists measured annual mean concentrations of Ni from monitoring sites in Swansea Urban Area agglomeration zone from 2004 to 2013, and Figure 2 indicates the location of measurement sites. There is one measured exceedance at Pontardawe Tawe Terrace (GB1016A) in 2013 for which this report relates. Figure 3 shows the location of the exceedance situation in detail. This map also shows the locations of the monitoring sites in the vicinity of the exceedance situation and the locations of local industrial sources. The map in Figure 3 shows that Pontardawe Tawe Terrace is located within the exceedance situation Swansea [Ni_UK0027_2013_1]. The measured concentrations of Ni at other monitoring sites within the Swansea Urban Area agglomeration zone were all below the target value in 2013.

Figure 3 shows the high resolution zone boundary used to assign the locations of monitoring sites in grey and the zone boundaries for the 1 km grid used to assign exceedance situations and associated populations as black hatching. The local topography and locations of settlements results in the Swansea Urban Area Agglomeration zone extending up the Swansea Valley but only the larger urban areas are assigned to the agglomeration zone within the 1 km gridded data.

Figure 2. Location of monitoring sites in Swansea Urban Area.

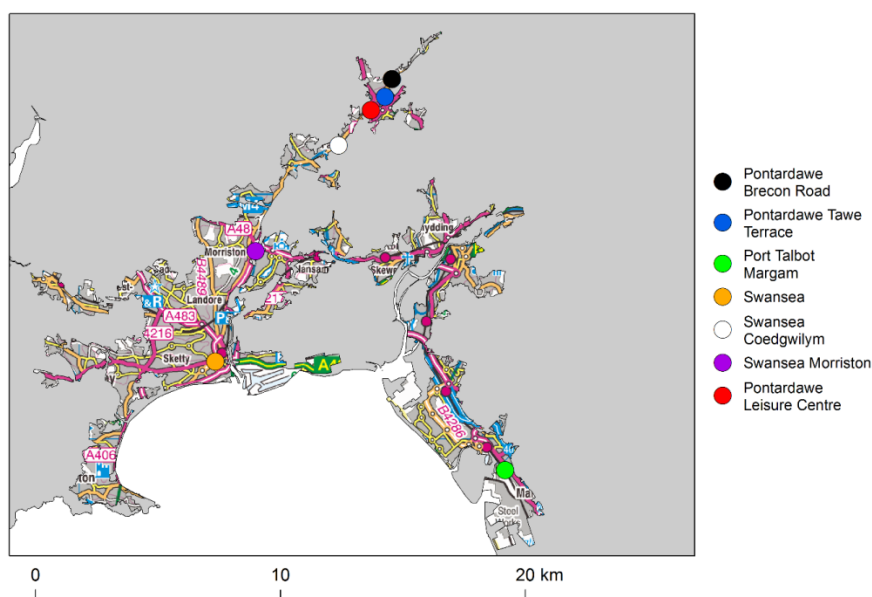
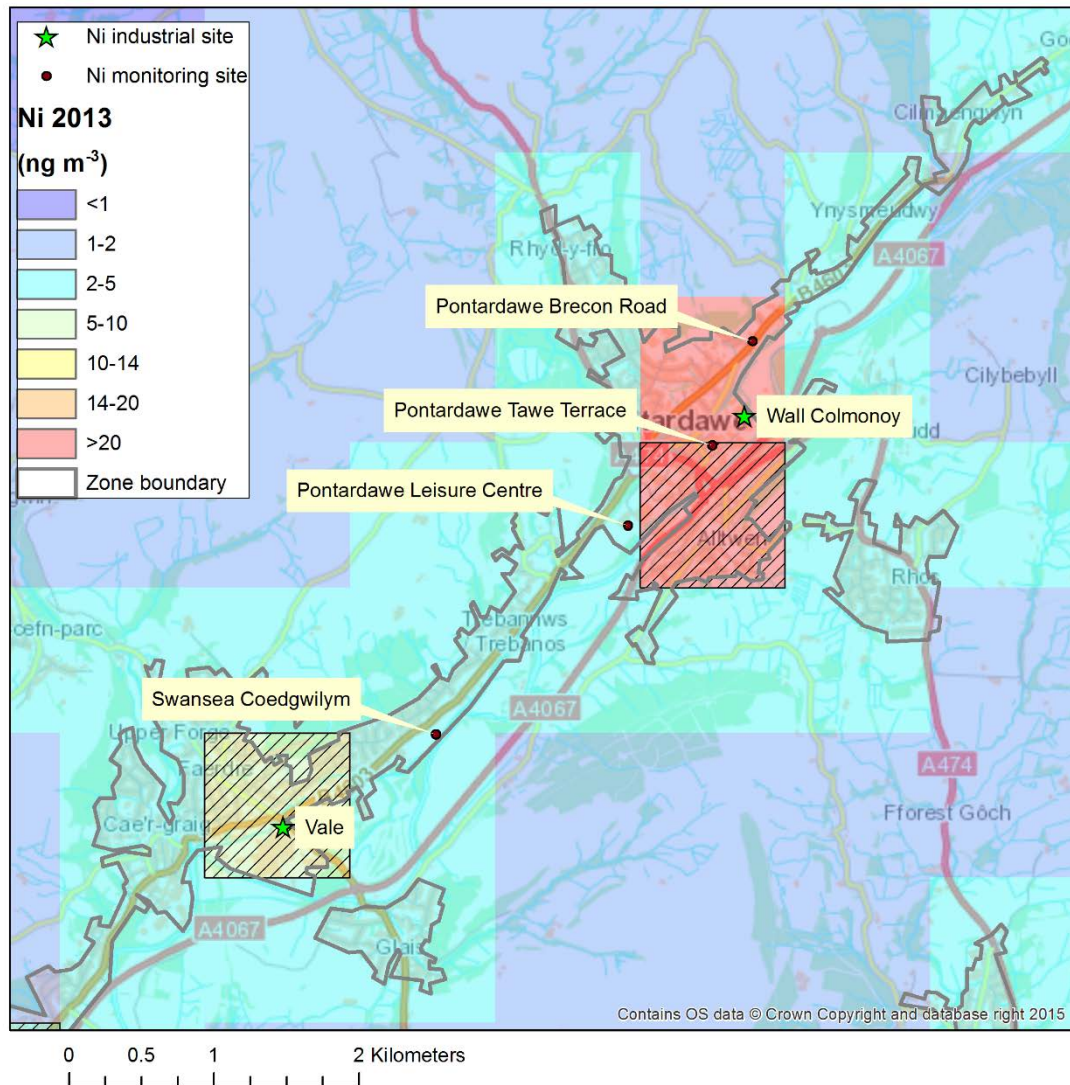


Table 2. Measured annual mean Ni concentrations in Swansea Urban Area agglomeration zone UK0027 from 2004 to 2013 (ngm⁻³). (Percentage data capture is shown in brackets).

Station (Eol code)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Pontardawe Brecon Road (GB1015A)								6.5 (37)	6.6(94)	5.7 (98)
Pontardawe Tawe Terrace (GB1016A)								28 (93)	30 (98)	37 (98)
Port Talbot Margam (GB0906A)					2.0 (98)	1.4 (92)	1.5 (100)	1.7 (97)	1.4 (99)	1.5 (100)
Swansea (GB0609A)	34 (96)	20 (97)	26 (97)	28 (64)						
Swansea Coedgwilym (GB0981A)					20 (100)	16 (96)	10 (98)	11 (92)	8.5 (84)	7.8 (100)
Swansea Morrision (GB0979A)					7.6 (87)	9.3 (98)	15 (98)	8.2 (95)	5.6 (98)	6.5 (100)
Pontardawe Leisure Centre*	76	47	74	70	43	29	8.5	15	14	12

* Pontardawe Leisure Centre is a Local Authority monitoring site. It is included here as the site was operated continuously between 2004 and 2013. Data capture statistics were not available for this site.

Figure 3. Exceedance situation Swansea [Ni_UK0027_2013_1]. Exceeding grid squares are marked red. Locations of local industrial sites Wall Colmonoy works at Pontardawe and Vale Europe Ltd Clydach refinery and the locations of local monitoring stations are also shown. Non-hatched grid squares are assigned to the South Wales zone UK0041 and do not form part of this exceedance situation.



2.2 Source apportionment

Modelling has been used to determine the annual mean Ni source apportionment for the exceedance situation. National modelling on a 1 km x 1 km grid resolution apportions the Ni concentration to background sources. Additional fine scale modelling has also been carried out to characterise local industrial emissions for the Wall Colmonoy site located within the exceedance situation, this is described in Appendix 1.

Table 3 provides a breakdown of the main emission sources (source apportionment) that have contributed to the grid square in this exceedance situation. It is clear that industrial sources are the main source associated with this exceedance situation. The final column in the table is the total from all emissions sources. The values in this column have been rounded to integers for consistency with the values in the compliance assessment. The values in the other columns have not been rounded. The other shaded columns are the subtotals for the regional, urban background and local contributions. Table 4 gives a more detailed source apportionment for the industry sector and shows that the main source associated with this exceedance situation is fugitive emissions attributed to local unidentified industrial activities. Appendix 1 discusses the uncertainties in the identification of this source of Ni in air and the activities that are being undertaken by the Welsh Government to understand this emissions source. Stack emissions from the Wall Colmonoy works contributed to the exceedance situation, although the contribution was small compared with the assumed unidentified fugitive emissions. The emissions from Wall Colmonoy are regulated by the Neath Port Talbot County Borough Council and measures undertaken (see section 2.3) describe how these stack emissions have been reduced by a factor of ten since 2009.

Table 3. Source apportionment for exceedance situation Ni_UK0027_2013_1. Annual mean Ni concentration (ngm⁻³).

OS easting (m)	OS Northing (m)	Zone	Regional background: Total	Regional background: From within Member State	Urban background increment: Total	Urban background increment: Traffic	Urban background increment: Industry including heat and power production	Urban background increment: commercial and residential ⁵	Urban background increment: Shipping	Urban background increment: Off road mobile machinery	Urban background increment: Other	Local increment: Total	Local increment: Industry including heat and power production	Total for all emission sources
272500	203500	27	1.48	1.48	3.38	0.01	0.13	3.19	0.01	0.03	0.00	32.37	32.37	37

⁵ The commercial and residential combustion contribution to urban background sources are associated with use of petroleum based fuels for domestic heating.

Table 4. Detailed source apportionment for industrial sources only for exceedance situation Swansea [Ni_UK0027_2013_1]. Annual mean Ni concentration (ngm⁻³).

OS easting (m)	OS Northing (m)	Zone	Wall Colmonoy stack emissions	Fugitive emissions	Local increment: Industry including heat and power production
272500	203500	27	3.42	28.95	32.37

2.3 Measures

Air quality is a high priority for the Welsh Government, including the attainment of EU target values. The government brings together the regulators and local industrial operators with emissions of Ni to air in pursuit of this aim. Recent meetings have enabled:

- the Welsh Government to communicate to the industrial regulators and operators the extent of the issue and the seriousness with which it is taken;
- the regulators to demonstrate that the operators are applying all cost-effective measures, and in particular are applying best available techniques as required by Council Directive 96/61/EC;
- the operators to cooperate and share best practice in managing their operations; and
- the development of the latest evidence in understanding the predominant sources.

Table 5 presents measures that have been taken and are to be taken at the Wall Colmonoy and Vale industrial sites. Emissions from the Vale site are not identified as contributors to this exceedance situation but will contribute to the background concentrations in the area. The regulator for the Vale site, Natural Resources Wales, has assessed that the measures that have already been taken by Vale constitute BAT for the industrial site. The regulator for the Wall Colmonoy site, Neath Port Talbot County Borough Council, has assessed that the measures that have been taken at the Wall Colmonoy site also constitute BAT.

The measures introduced by Wall Colmonoy in 2014 have resulted in significant reductions in the stack emissions resulting in a ten-fold reduction in stack emissions since 2009.

Despite significant reductions in stack emissions from the Wall Colmonoy site, annual mean concentrations of Nickel at the Pontardawe Tawe Terrace site have not reflected this trend. Given the level of uncertainty and the cause and spatial extent of this local exceedance, the Welsh Government is undertaking further measurement studies to help identify the predominant sources (more information is provided at the end of this report)

Table 5. Table of measures taken or to be taken at Wall Colmonoy and Vale industrial sites.

Measure code	Measure Description	Classification	Implementation dates		Other information		Comment
Wall Colmonoy_1	Water wash cyclone filtration for casting foundry	Permit systems and economic instruments: Other measure	Start:	2010	Source affected:	Industry including heat and power production	Regulator (Neath Port Talbot County Borough Council) have assessed that this system meets BAT
			Expected end:	2010			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Nickel concentration in emissions test: October 2014 results of 0.01 mgm-3 against limit specific in environmental permit of 15 mgm-3	
				Target emissions reduction:	Not available		
Wall Colmonoy_2	New local exhaust ventilation system and filter unit installed in the powders section	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
				Target emissions reduction:	Not available		
Wall Colmonoy_3	Deep clean of powders section	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	

					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_4	Install new centralised vacuum system in powders section	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_5	New LEV and filter in fettling section	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_6	Deep clean of atomising section	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall	Flap curtains	Permit systems and	Start:	2014	Source affected:	Industry including	Not available

Colmonoy_7	installed between the powder room and driers to minimise escape of dust from powder room	economic instruments: Other measure	Expected end:	2014		heat and power production	
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_8	Nutating inlets (containment at transfer points) fitted on lockers (screens) 7 & 8	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_9	New enclosure and Local Exhaust Ventilation (LEV) filter on blenders dispense into sieve	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_10	Lip extraction fitted to furnaces feeding atomising (powder manufacture) Tower 4	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	

					Target emissions reduction:	Not available		
Wall Colmonoy_11	Dalamatric filter system upgraded with bags to same specification as Vale A1 site	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available	
			Expected end:	2014				
			Status:	Implementation	Spatial scale:	Local		
						Cost:		Not available
						Indicator:		Nickel concentration in emissions test. November 2014 results of 0.01 mgm-3 against limit specific in environmental permit of 15 mgm-3
			Target emissions reduction:	Not available				
Wall Colmonoy_12	Russell sieve enclosed with curtains	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available	
			Expected end:	2014				
			Status:	Implementation	Spatial scale:	Local		
						Cost:		Not available
						Indicator:		Not available
			Target emissions reduction:	Not available				
Wall Colmonoy_13	Cut off saw bag filters installed	Permit systems and economic instruments: Other measure	Start:	2012	Source affected:	Industry including heat and power production	Not available	
			Expected end:	2012				
			Status:	Implementation	Spatial scale:	Local		

					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_14	Cyclone followed by bag filter (Dalamatric) arrestment used in powder manufacturing (atomising)	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
				Target emissions reduction:	Not available		
Wall Colmonoy_15	HEPA filters used on drier units where air is emitted to internal atmosphere	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
				Target emissions reduction:	Not available		
Wall Colmonoy_16	Workplace nickel monitoring to take place to identify hot spots.	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Results from this monitoring will be used to identify and prioritise future improvements
			Expected end:	2015			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
				Target emissions reduction:	Not available		
Wall	Ambient (external)	Permit systems and	Start:	2015	Source affected:	Industry including	Not available

Colmonoy_17	monitoring is to take place to help identify any hot spots	economic instruments: Other measure	Expected end:	2015		heat and power production	
			Status:	Preparation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_18	Modify hoods in castings 450kg furnaces. Only extract from two working furnaces instead of all four	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Not available
			Expected end:	2015			
			Status:	Preparation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
Wall Colmonoy_19	Install water flow alarms on Aqualine filter system	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Not available
			Expected end:	2015			
			Status:	Preparation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
Wall Colmonoy_20	Roll out of differential pressure gauges on all Local Exhaust Ventilation (LEVs) including those <	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Not available
			Expected end:	2015			
			Status:	Preparation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	

	50m3/min				Target emissions reduction:	Not available	
Wall Colmonoy_21	Air drier pans LEV to be improved	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Not available
			Expected end:	2015			
			Status:	Preparation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
		Target emissions reduction:	Not available				
Wall Colmonoy_22	Extraction for maintenance area. Likely to involve welding fume only, no nickel	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Dependent on results of workplace nickel monitoring
			Expected end:	2015			
			Status:	Preparation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
		Target emissions reduction:	Not available				
Wall Colmonoy_23	Door closures for existing maintenance area	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Dependent on results of workplace nickel monitoring
			Expected end:	2015			
			Status:	Planning	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
		Target emissions reduction:	Not available				
Wall Colmonoy_24	Improve powder decanting arrangements on	Permit systems and economic instruments: Other	Start:	2015	Source affected:	Industry including heat and power production	Dependent on results of workplace nickel monitoring

	Tower 4. Better enclosure & LEV	measure	Expected end:	2015	Spatial scale:	Local	
			Status:	Planning	Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Wall Colmonoy_25	TD100 discharge under positive pressure. Can put strain on neoprene at transfer points	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Dependent on results of workplace nickel monitoring
			Expected end:	2015			
			Status:	Planning	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
		Target emissions reduction:	Not available				
Wall Colmonoy_26	Enclose vibratory feeders	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Dependent on results of workplace nickel monitoring
			Expected end:	2015			
			Status:	Planning	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
		Target emissions reduction:	Not available				
Wall Colmonoy_27	DSB mill LEV solution to be established before installation. Although this is already within an enclosed room	Permit systems and economic instruments: Other measure	Start:	2015	Source affected:	Industry including heat and power production	Dependent on results of workplace nickel monitoring
			Expected end:	2015			
			Status:	Planning	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
		Target emissions	Not available				

					reduction:		
Wall Colmonoy_28	Possible replacement of Aqualine system with Vent-Tech filters	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Current system already meets BAT, assessment has shown little potential for improvement, high cost and uncertainty as to likely performance of alternative system. Emissions are already at detection limit. Measure therefore not needed and will not take place.
			Expected end:	2014			
			Status:	Other			
				Cost:	Not available		
				Indicator:	Nickel concentration in emissions test.		
				Target emissions reduction:	Not available		
Wall Colmonoy_29	Waste from bag filters are collected in enclosed drums, which are sealed prior to disposal by licenced carrier. Dust collected by the Aqualine system is saturated with water and is placed in Intermediate Bulk Containers before disposal by registered waste carrier.	Permit systems and economic instruments: Other measure	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation			
				Cost:	Not available		
				Indicator:	Not available		
				Target emissions reduction:	Not available		

Vale_1	Installation of stack filtration plant (bag house) to replace electrostatic precipitators	Permit systems and economic instruments: IPPC permits	Start:	2007	Source affected:	Industry including heat and power production	This was the most significant measure for this source.
			Expected end:	2007			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Monthly average particulate concentration from main stack reduced from ~10 mgm-3 to less than 1 mgm-3	
					Target emissions reduction:	3: Annual stack emission reduced from 2855 kg in 2007 to less than 100 kg by 2009, value in 2013 was 42 kg	
Vale_2	Undertook soil remediation on abandoned parcel of contaminated land to render contained nickel inert	Permit systems and economic instruments: IPPC permits	Start:	2011	Source affected:	Industry including heat and power production	Not available
			Expected end:	2011			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Vale_3	Consolidated 3 emission points from Powder Plant Storage Hoppers	Permit systems and economic instruments: IPPC permits	Start:	2012	Source affected:	Industry including heat and power production	Not available
			Expected end:	2012			
			Status:	Implementation	Spatial scale:	Local	

	into 1 emission point and installed HEPA filter at outlet				Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Vale_4	Replaced cladding and added belt enclosure on feed conveyors	Permit systems and economic instruments: IPPC permits	Start:	2013	Source affected:	Industry including heat and power production	Not available
			Expected end:	2013			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	
Vale_5	Replaced all 1700 filter bags on the Stack Filtration Plant as part of planned preventative maintenance	Permit systems and economic instruments: IPPC permits	Start:	2014	Source affected:	Industry including heat and power production	Not available
			Expected end:	2014			
			Status:	Implementation	Spatial scale:	Local	
					Cost:	Not available	
					Indicator:	Not available	
					Target emissions reduction:	Not available	

Table 6. Reported annual Ni emissions to air from Vale works (kg year⁻¹).

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Stack	1934	763	1382	3154	2855	193	56	96	25	31	42
Other	54	280	31	12	116	93	45	16	11	29	37

Table 7. Reported annual stack emissions of Ni from Wall Colmonoy site (kg year⁻¹).

	2008	2009	2010 ^a	2011	2012	2013
Stack	157.57	157.57	89.93	37.25	74.48	15.82

^a Abatement measures implemented mid-2010. Reported emissions assume 6 months emissions at 2009 levels and six months at post abatement emissions level of 22.29 kg year⁻¹.

A comparison between the reported annual Ni emissions from Vale works in Table 6 and annual Ni concentrations recorded at local monitoring sites in Table 2 shows good agreement between the timing of reductions of reported emissions at Vale site and the trend in measured annual mean Ni concentrations at the long running Pontardawe Leisure Centre site. In particular the timing of the large decline at this site between 2007 and 2010 coincides with the large reduction in reported stack emissions from the Vale works.

A similar comparison between reported annual Ni emissions from Wall Colmonoy site in Table 7 and Ni concentrations at local monitoring sites shows that there is a lack of agreement between the reductions in reported emissions from the Wall Colmonoy site and measured annual mean Ni concentrations at Pontardawe Tawe Terrace. Given the level of uncertainty in the cause and spatial extent of this local exceedance, the Welsh Government is undertaking further measurement studies to help identify the predominant sources.

Appendix

A1 Assessment of industrial source

A1.1 Local scale modelling of the industrial point source

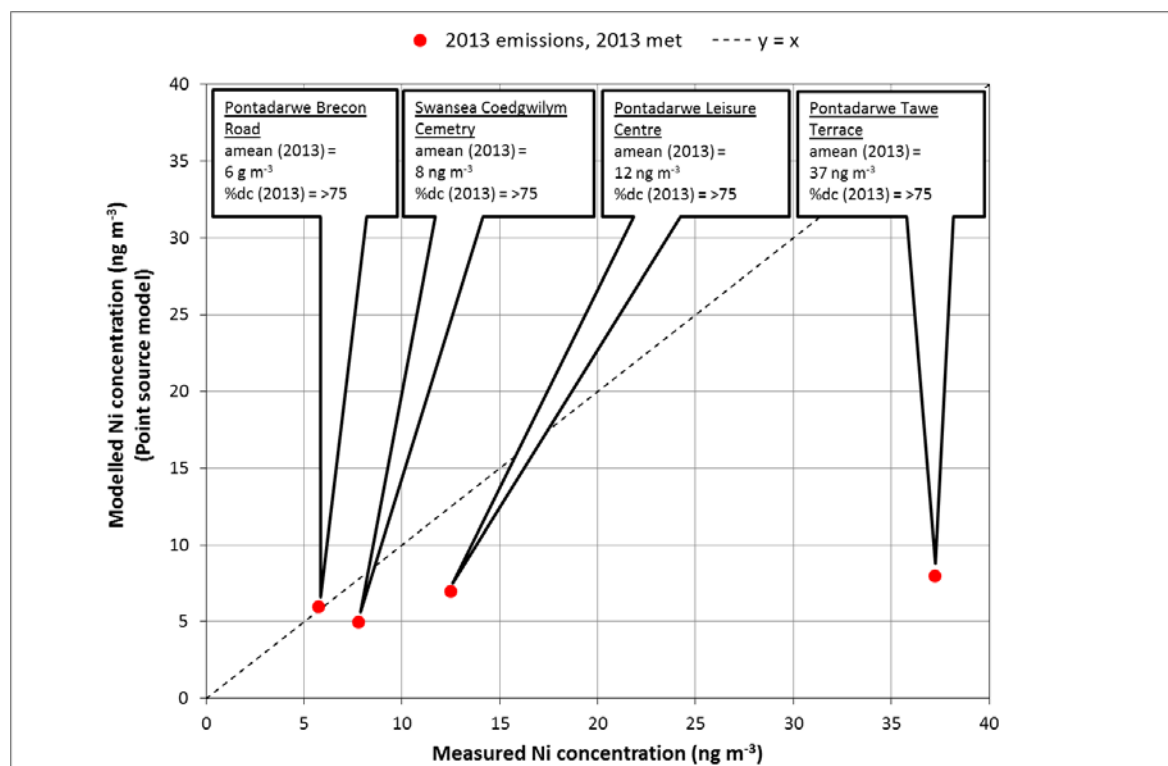
Detailed dispersion modelling has been undertaken using ADMS 5.0 for the area in South Wales where exceedances of the annual mean target value of 20 ng m^{-3} have been measured. This small scale modelling has been used to assess the likely magnitude and spatial scale of the exceedance.

Modelling was carried out at a spatial resolution of $20 \text{ m} \times 20 \text{ m}$ over an area of $2 \text{ km} \times 2 \text{ km}$ centred on the industrial point source. Information on the Ni emissions from the principal Ni point source were provided by the site operator. Ni emissions were taken to be $15.82 \text{ kg year}^{-1}$ for 2013, emitted from six emission points distributed across the site. This annual emission took into account recent abatement measures put in place on-site. Building effects were included in the model, and a $6 \text{ km} \times 6 \text{ km}$ area was extracted OS Terrain 50 dataset to allow the effect of the topographical features of the valley to be included in the model. The height of the terrain was specified at the centre of each $50 \text{ m} \times 50 \text{ m}$ grid square.

The results of this point source modelling were assessed at the location of three nearby national monitoring stations Pontardawe Tawe Terrace, Pontardawe Brecon Road and Swansea Coedgwilym and one Local Authority monitoring station Pontardawe Leisure Centre. Figure A1 shows presents the correspondence between measured concentrations and modelled concentrations. The modelled concentration presented is the sum of the point source component from the local model and the background component from the national model. There is reasonable agreement between the measured and modelled concentrations at Pontardawe Brecon Road, Swansea Coedgwilym and Pontardawe Leisure Centre.

The modelled concentration of Ni at Pontardawe Tawe Terrace which results from this local modelling was 3.4 ngm^{-3} in 2013. The national model provides a background Ni concentration of 4.9 ngm^{-3} which is added to the results of the point source model. The sum of the point source and background contributions is 8.3 ngm^{-3} and is well below the annual mean Ni concentration of 37 ngm^{-3} measured at the monitoring station.

Figure A1: Comparison between measured and modelled Ni concentrations. Modelled concentrations are the sum of contributions from the local point source model and the national background model.



A1.2 Investigation of unknown source

The reason for the difference between the measured and modelled Ni concentrations is not known. Possible reasons include uncertainties in the assumed model inputs, the inherent dispersion model uncertainty and the presence of unidentified sources. In light of this uncertainty, the following discussion summarises details of a modelling scenario with conservative assumptions, undertaken to assess the impact of potential fugitive emissions of Ni in the Swansea Valley on modelled Ni concentrations. This modelling is carried out to provide a precautionary assessment of the possible spatial extent of the measured exceedance.

However due to the discrepancy between the measured and modelled concentrations of Ni at the known location of exceedance (Pontardawe Tawe Terrace), further measurement campaigns are being undertaken, as described below. This will help to improve the confidence in the source apportionment and identification of the predominant sources, and confirm the spatial extent of the exceedance. When new evidence comes to light the assumptions made in the modelling described below will be reassessed and the extent of the exceedance re-evaluated.

Modelling

In light of the difference between the measured and modelled Ni concentrations, as a precautionary approach, further modelling was carried out to understand the impact of fugitive emissions from an unconfirmed source in the Swansea Valley on ambient Ni concentrations in the Swansea Valley. The modelling scenario assumes that the fugitive emissions were located at the site of the local industrial

point source. However, it should be noted that there is currently no direct evidence to support the location of this fugitive source at this site.

Fugitive emissions were modelled as a rectangular unit volume source emission of width 16 m, length 43 m and height 3 m and located at the site of the local industrial point source. Dispersion modelling of the volume source was carried out using ADMS 5.0 with the same methodology as described for the Ni point source emissions. The resulting calculated Ni concentrations were scaled so that the sum of contributions from the point source modelling, the fugitive emissions and the ambient background modelling matches the measured annual mean concentration of 37 ng m^{-3} at Pontardawe Tawe Terrace. From this scaling the annual mean fugitive emissions can be estimated to be 5.4 kg year^{-1} in 2013. Figure A2 shows a comparison between measured and modelled concentrations of Ni including the volume source model. Concentrations of Ni are over predicted at Pontardawe Brecon Road, however there is reasonable agreement between modelled and measured concentrations at Pontardawe Leisure Centre and Swansea Coedgwilym.

Figure A3 shows the modelled annual mean Ni concentrations resulting from the local industrial point source in Pontardawe and including fugitive source emissions. The Ni concentrations in Pontardawe were strongly influenced by the terrain in the area, as can be seen in Figure A3. The Swansea Valley runs south-west to north-east through the village of Pontardawe, where the point source is located. Figure A3 shows that the distribution of the Ni concentrations in the vicinity of Pontardawe corresponded with the local topography. This is believed to be due to channelling of the local wind flow by the Swansea Valley.

The conclusions from this dispersion modelling scenario are that there was an exceedance of the Ni target value in the Swansea urban area zone in 2013, and it is likely there was also an exceedance in the adjacent South Wales zone. This exceedance was likely to have extended over a spatial area of relevance to the directive (at least $250 \text{ m} \times 250 \text{ m}$ for industrial locations).

Figure A2: Comparison between measured and modelled Ni concentrations. Modelled concentrations are the sum of contributions from the local point source and volume source model and the national background model.

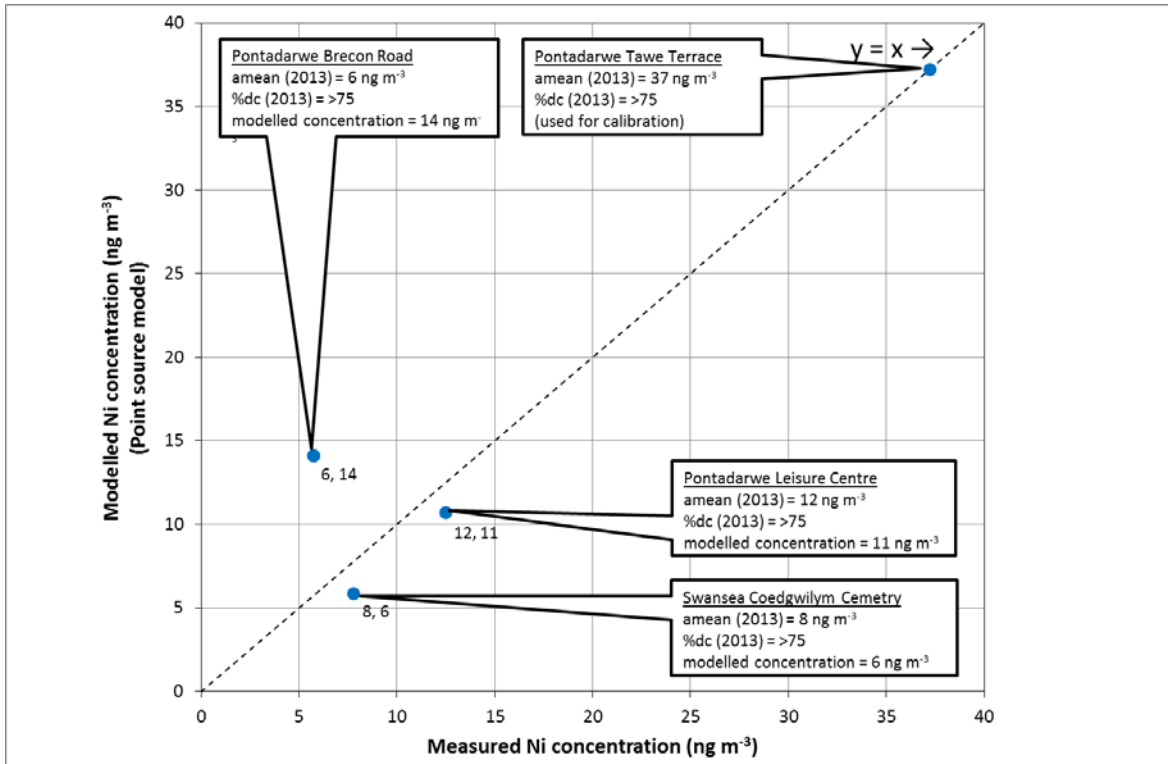
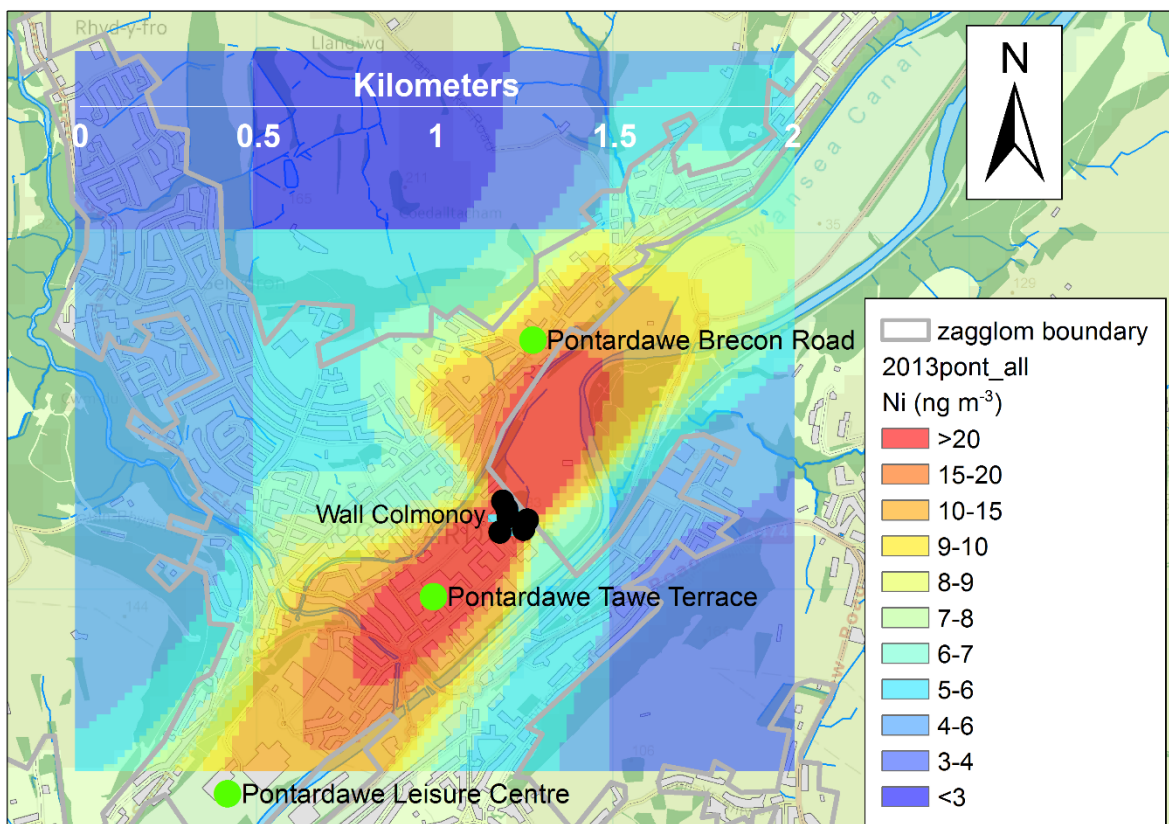


Figure A3: Modelled annual mean Ni concentration resulting from the local industrial point source in Pontardawe in 2013.



Measurement campaigns

Given the level of uncertainty in the extent and cause of this local exceedance, the Welsh Government is undertaking further measurement studies to help identify the predominant sources.

During the summer of 2015, the sampling frequency at Pontardawe Tawe Terrace was increased from weekly to daily. The assessment of the data measured from August to September 2015 looked at the relationship between local meteorological data, the levels of Ni compared with other metals and industrial activity to help identify and disaggregate local and regional sources. This will be an indicative assessment and results will help inform additional monitoring to be carried out in 2016.

To strengthen the evidence base further, the Welsh Government has procured a source apportionment assessment by the Environmental Research Group at King's College London. This will combine the deployment of the latest high time resolution (down to 15 minute periods) metal monitoring equipment with state-of-the-art assessment techniques to provide a robust understanding of the sources contributing to the exceedance situation. This work will generate concentration data for shorter time periods that will be able to relate to changes with regards to daily activity at the local industrial site.

As the pollution issue pertains exclusively to Ni and other trace elements, an XACT 625 Metal Monitor will be deployed near to the Tawe Terrace site for one month. Local meteorological measurements will be made from a mast attached to the trailer. The high time resolution measurements will be analysed using bivariate polar plot and clustering methods. Bivariate polar plots have been widely used to assess the sources of gaseous and PM₁₀ emissions in locations worldwide, however new techniques such as the conditional probability function for extracting source information have recently been developed and deployed at complex industrial sites. The high time resolution measurement, coupled with meteorological data as well as local activity data, should enable local and regional sources to be identified and disaggregated.