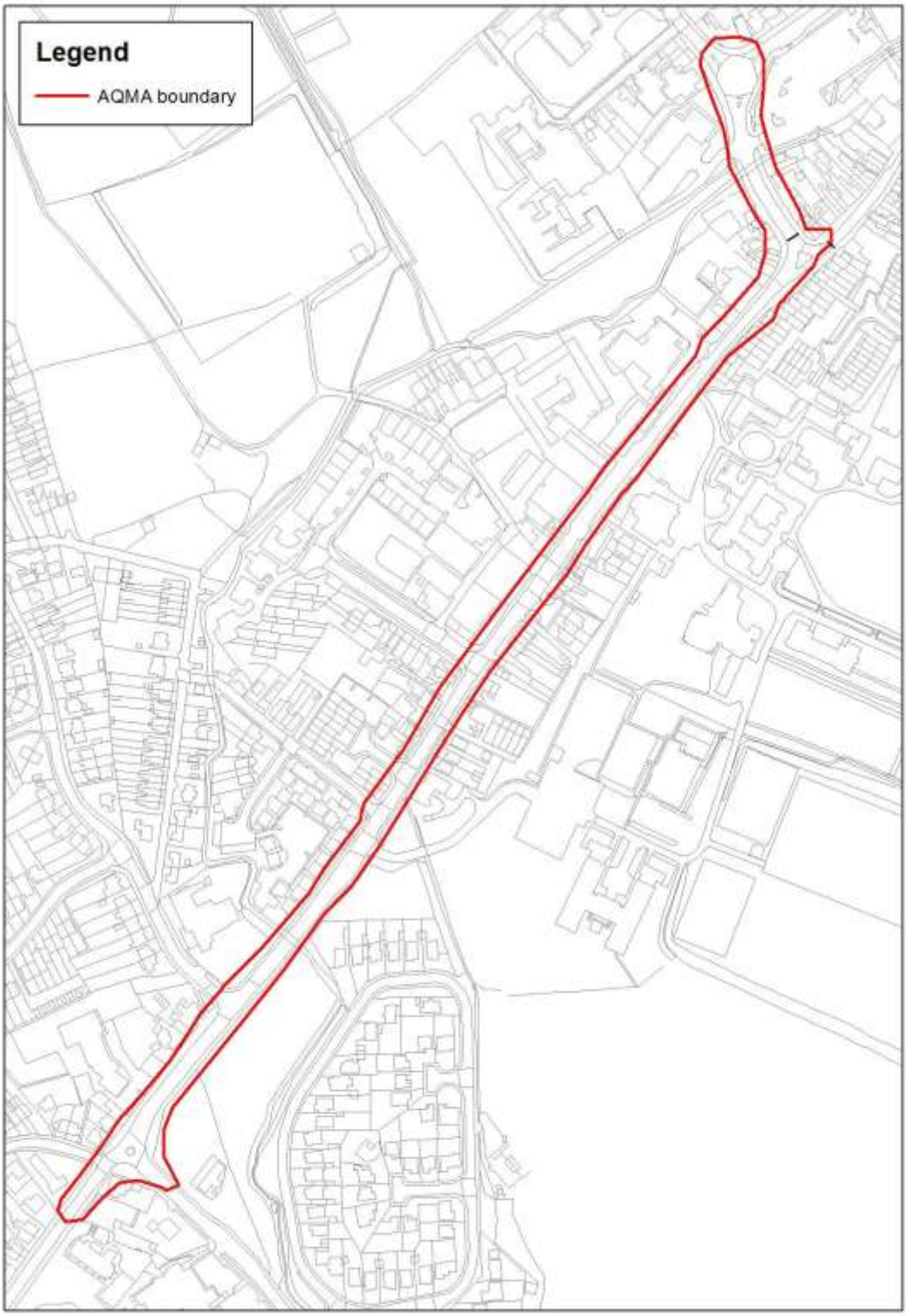
3.4 Worcester Road AQMA - Bromsgrove District Council

Date of Detailed Assessment: July 2010
Date of Declaration: 24th October 2011
Date of Further Assessment: March 2012

Figure 3-9 Plan of AQMA



The Current area of the AQMA comprises the B4091 Worcester Road single carriageway from St Peters Church at the bottom of Rock Hill up to and including the gyratory with the A448 Kidderminster/St Johns Road.

At the AQMAs southern extent is a mini roundabout providing access to the residential areas of Charford to the east and Highfield Road to the west. South Bromsgrove Community High School and St Peters Catholic First School are also accessible via Charford Road from the mini roundabout. Further residential properties line a large proportion of the B4091 Rock Hill as it continues south-west before joining the A38 Worcester/Redditch Road gyratory at the western extent of the Redditch Road AQMA. The A38 continues south-west to Wychbold and Junction 5 of the M5, and then onto Droitwich and Worcester City.

From the mini roundabout at the northern extent of the AQMA the A448 heads west past Bromsgrove School Housman House, Sanders Park and the residential area of Sidemoor. After under-passing the M5 the A448 heads out of Bromsgrove through several rural communities to Kidderminster.

The A448 turns north from the roundabout at the end of the AQMA into Market Street past a major superstore (Asda's) and the bus station immediately to the west of Bromsgrove Town Centre. At the busy crossroads with the B4091 Stourbridge Road and Birmingham Road the A448 turns east towards the Sideslow gyratory and Redditch beyond. Birmingham Road continues north connecting to the A38 Birmingham Road ½ km south of the Lickey End AQMA at Junction 1 of the M42.

The current boundary of the AQMA follows the contours of predicted pollution levels produced in the Detailed Assessment (July, 2010). However these straight contour lines cut through residential gardens, open fields and buildings which is not compliant with Defra guidance (LAQM.TG(09) and PG(09)) thus the AQMA boundary requires amendment.

3.4.1 Prevailing Conditions

AM and PM peak traffic time site observations of the Worcester Road AQMA were undertaken in 2012 to characterise existing conditions and identify issues in order to inform the focus of potential measures within the action plan. Photos from the site walkover are included at the end of this section.

From the A448 roundabout St Johns School and a number of commercial concerns bound the southern side of the AQMA on Hanover Street at its northern extent. On the northern side currently is a council car park although this area is earmarked for development with the Bromsgrove Town Centre Regeneration Plans (ref).

At about 100 metres from the A448 roundabout there is a zebra crossing at the bottom of the extent of Bromsgrove Town Centre. Here the road bends from a south easterly to a south westerly direction at the junction where Hanover Street continues into Worcester Road. The facades of commercial properties line the pavements around the bend and on for some distance on the western side of the carriageway including the Ye Olde Black Cross PH. There may be some residential properties on upper floors above retail units and the PH. In contrast, the eastern side of the eastern side of the carriageway has a row of residential properties (Hanover Place) some just a few meters away from the kerbside for approximately 80m. The narrowness of the carriageway and proximity of buildings to the kerbside creates a street canyon effect in this area.

On the eastern side of the carriageway a wall, approximately 110m long and high trees separate buildings of the Bromsgrove School Senior Campus from the public pathway. Trees

on the opposite side of the road may be compounding the street canyon effect mentioned above. Further residential properties, as close as a few metres to kerbside, then continue on for approximately 105m until the Turk Head PH opposite Sanders Road. The road narrows at this point creating a bit of a pinch point (and street canyon) to the traffic flow exacerbated by on street parking adjacent to the residential properties.

On the opposite side of the carriageway the Sanders Road Industrial Estate and other commercial properties including Broad Street DIY, Kwik Fit, Jewsons and a Gym front onto Worcester Road back up to the Black Cross PH. There is a pull-in layby for parking outside Jewsons and Vinci commercial establishments opposite the Bromsgrove School Senior campus. Continuing southwest from Sanders Road there are residential properties on both sides of the carriageway in close proximity to the roadside, just the width of the pavement again in some places.

The residential properties on the eastern side end after approximately 70m at a pedestrian pelican crossing and the main entrance for the Bromsgrove School. Beyond the turning is a pull in bus stop and then a large open space down to the St Peters/Rock Hill mini roundabout filling the corner between Worcester Road, Charford Road and residential properties setback 95m from the corner (although at the top of the triangular shaped development the nearest property is only 18.5m away from the kerbside but still some considerable distance in terms of proximity to NO_2 emissions).

On the western side of the carriageway the residential properties continue beyond two residential turnings, Ford Road and Westbourne Close until the Labour Club (now a Hungry Horse PH) on the corner of Shrubbery Road opposite the open area on the eastern junction. A pull in bus stop for northbound traffic is situated adjacent to the corner of the Labour Club car park. Another school, Millfields, located on Swifts Close and Jack and Jills Nursery on Millfields Road are both accessible via Shrubbery Road. On the other side of this busy junction is the One Stop convenience store and a few other commercial premises including Spadesborne House until a few residential properties at the St Peters/Rock Hill mini roundabout.

As indicated previously there are several schools within the vicinity, either directly or indirectly accessible from parts of the AQMA: Bromsgrove School has two campuses directly accessible from the Worcester Road and a third immediately west of the boundary and the A448 roundabout. St Johns Middle School is also accessed directly from the AQMA at its western extent. It also possible to access this by foot via pathways from Brook Road off of Shrubbery Road and vehicles were observed dropping off school pedestrians here. As mentioned above Millfields school and Jack and Jill Nursery are also accessible via Shrubbery Road and two more schools are accessible along Charford Road via the roundabout. Clearly this number of school destinations via the AQMA contributes significantly to the amount of traffic at AM peak times.

During site visits at peak traffic times in 2012 a high volume of traffic was noted travelling north and south. North of the main Bromsgrove School entrance commuters made up 95% of traffic observed and 70 to 80% of vehicles were estimated to have only one occupant during AM peak hours. Much of the northbound traffic (about 50% of vehicles up to 08:20) from the St Peters/Rock Hill mini roundabout was observed queuing to turn into the Bromsgrove School. Generally this was observed to move fair rapidly and enough room was generally available for non-school traffic to pass on inside of waiting vehicles with exception of HDVs.
During PM peak a general mix of cars, buses, LGVs and HGVs was noted.

Not much pedestrian traffic was observed during PM peak hours. At AM peak time school pedestrians and others were observed accessing the Zebra crossing at the top of Worcester

Road and less frequently the Pedestrian crossing adjacent to the Bromsgrove School entrance. It was also noted that school children were being dropped off at the Altered Images Gym and crossing the carriageway there to access the Senior School campus. Occasional southbound traffic queues were caused by use of zebra crossing and school traffic entering main Bromsgrove School entrance and pedestrian crossing further south.

The Shrubbery Road junction was noted to be a particularly busy junction during the site visits. This is a relatively narrow residential road with many cars parked half up pavements and on the road some ignoring double yellow lines to access One Stop convenience store. This restricts the road to almost single car width at times causing problems in this busy side road.

Parked vehicles outside residential properties either side of the Turk Head PH was observed to cause some disruption to traffic in both directions. Here the road narrows to a street canyon and there is reduced capacity for two columns of traffic to comfortably pass parked cars particularly when northbound HDVs are approaching. Thus southbound traffic occasionally had to pause behind the parked cars to allow oncoming traffic to pass first. This was highlighted during visit by ambulance in attendance at one of the residential properties causing southbound traffic congestion.

There are additional bulbous kerbs on the south side of the Shrubbery Road junction assumed to be traffic calming measures designed to dissuade vehicles from parking on this corner. There are pull-in parking spaces, enough approximately for four or five vehicles outside the convenience store generally observed to be always occupied and thus insufficient for purpose. School and local traffic exiting right from this junction towards the St Peters/Rock Hill roundabout was noted to occasionally cause congestion within Worcester Road.

Sanders Road leading to the industrial estate has the potential to be a busy junction and destination for HGVs but not much traffic was actually observed turning onto this road during the site visits. The industrial estate is a potential redevelopment target within the Bromsgrove Town Centre Regeneration Draft plan.

There are double yellow lines along many parts of the AQMA but not continuously. Areas with restrictions observed were at the Shrubbery Road junction, the Bromsgrove School main entrance, Peters Finger lane just south of the Turks Head PH, Sanders Road and continuously from the walled Bromsgrove School Senior campus and opposite to the A448 roundabout. In addition to Shrubbery Road mentioned above a few delivery vehicles, noted on separate occasions, parked on the double yellow lines adjacent to Hanover Place causing partial obstruction to traffic.

Bus stops indicated Worcester Road is the route for the 144 and 143 (First) services. A number of 54/05 plate single decker and double decker buses were observed, generally between ¼ and ½ full. Occasional private single Clearaway of Catshill minibuses labelled Charford service were noted. It was not possible to discern the age of these vehicles from number plates but the vehicle fleet appeared to be relatively old.

Photo 1: Looking NW from Worcester Road to Hanover Street W and towards Town Centre N

Photo 2: Looking SW from Hanover Place to zebra crossing at top of Worcester Road, street canyon and PH to left

Photo 3: Looking NW at street canyon at top of Worcester Road

Photo 4: Looking NE at street Canyon

Photo 5: From adjacent to Bromsgrove School Senior Campus boundary Looking N to parked vehicle ignoring road restrictions at top of Worcester Road

Photo 6: Looking N along Worcester Road. Off road parking at Commercial.

Photo 7: Looking S on Worcester Road from Sanders Road Industrial Estate at mid-way street canyon/pinch point

Photo 8: Looking S on Worcester Road to slow moving traffic passing Pedestrian crossing and main Bromsgrove School entrance

Photo 9a & b: Looking S at traffic entering Bromsgrove School

Photo 10: Looking W at Shrubbery Road and Labour Club

Photo 11: Looking SW to One Stop convenience store and adjacent parking

3.4.2 Summary of any Further Assessment report

A Further Assessment to confirm the requirement for an AQMA in Worcester Road, Bromsgrove and undertake modelling to inform potential solutions was completed by independent consultants Air Quality Consultants (AQC, 2012b) on behalf of BDC and WRS in March 2012. A summary of the findings of the Further Assessment is outlined below.

- The model results are consistent with the monitoring data and modelling carried out for the Detailed Assessment.
- The results indicate that the annual mean nitrogen dioxide objective is only being exceeded at a number of properties along the street canyon sections of Worcester Road i.e. its middle and northern sections.
- The highest predicted concentration in 2010 is 54.9 µg/m^3, at 16 Worcester Road (R23). Concentrations are also predicted to exceed the annual mean objective at 9 other receptors.
- There are no predicted annual mean concentrations greater than 60 µg/m^3 and therefore it is unlikely that the 1-hour nitrogen dioxide objective is being exceeded at these locations.
- The results demonstrate there are predicted exceedences of the annual mean objective within the existing AQMA and therefore the AQMA should be retained.
- AQC recommend that the AQMA boundary, as a minimum, be based on those residential properties where concentrations of 36 µg/m^3 or greater are predicted to allow for the uncertainty in the measured and predicted concentrations.
- The modelling results demonstrated that properties 1 to 10 Worcester Road, where predicted concentrations are greater than 36 µg/m^3 but below 40 µg/m^3, are currently outside of the current AQMA boundary. Monitoring at Loc. WR (11 Worcester Road) measured a concentration in excess of the annual mean objective. On this basis AQC recommend that the AQMA boundary needs to be extended to include those properties.

3.4.3 Source Apportionment Data

Sources contributing to the objective exceedences within the AQMA have been identified within the Further Assessment. The data presented below have been calculated in line with guidance provided in LAQM.TG(09) (Defra, 2009).

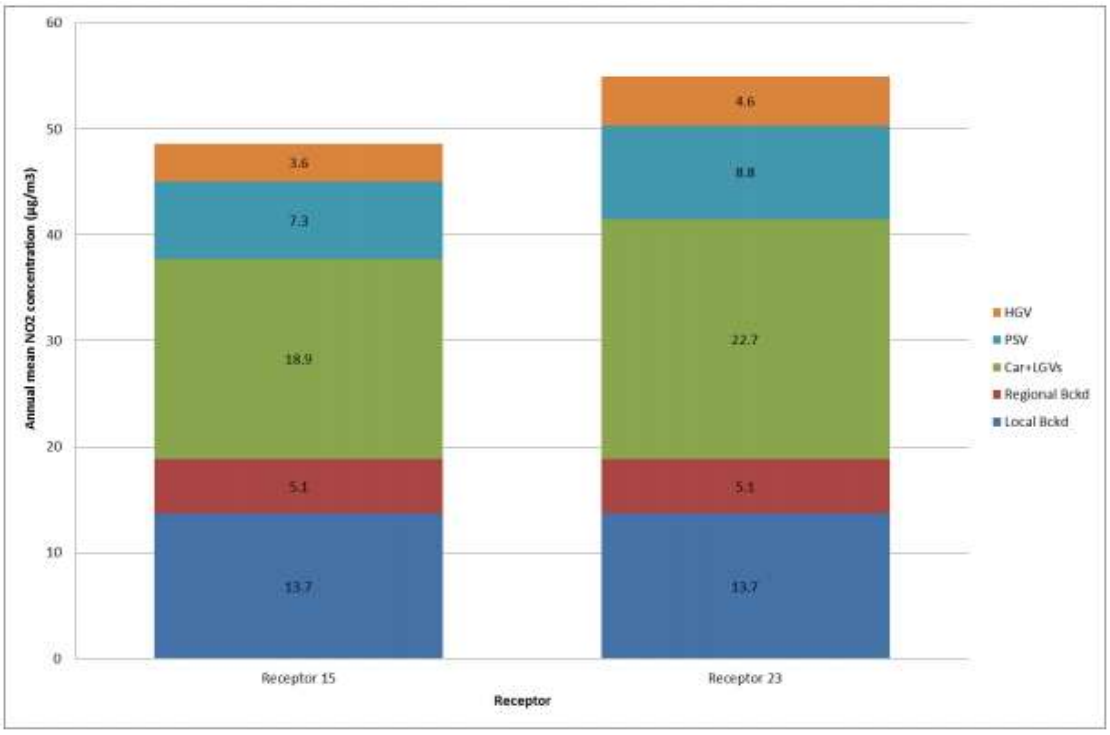
Table 3-13 and Figure 3-10 (AQC, 2012b) set out the relative contributions of traffic emissions to the total predicted nitrogen dioxide concentration at two receptor locations.

Table 3-13 Predicted Annual Mean (2010) Nitrogen Dioxide Concentrations and the Contribution of Each Source Type to the Total

Receptor	Annual Mean Concentration (µg/m^3)					
	Local Bkgd	Regional Bkgd	Cars + LGV	PSV	HGV	Total
R15	13.7	5.1	18.9	7.3	3.5	48.6
R23	13.7	5.1	22.7	8.8	4.6	54.9
	% Contribution to Total					
	Local Bkgd	Regional Bkgd	Cars + LGV	PSV	HGV	Total
R15	28.2	10.5	39.0	15.0	7.3	100.0
R23	24.6	9.2	41.3	16.1	8.4	100.0

Two receptor locations identified previously have been used to provide an overview of source contributions. Table 3-13 and Figure 3-10 show that the most significant components for both Receptors 15 and 23 is from Cars and LGVs, closely followed by HDVs (HGVs and PSVs (buses)) and background concentrations. Cars and LGVs make up approximately 98% of the traffic volume on Worcester Road, and contribute 41.3% to the total concentration. Despite making up a relatively small proportion of the total traffic volume (1.2% on Worcester Road), PSVs contribute up to 16.1% to the total concentrations and HGVs make up less than 1% of the traffic volume but contribute up to 8.4% to the total concentrations.

Figure 3-10 Relative Contribution of Each Source Type to the Total Annual Mean Nitrogen Dioxide Concentration (µg/m3) at Receptor Locations where exceedences of the Annual Mean Objective are Predicted.



3.4.4 Air Quality Improvement Required.

The degree of improvement, identified in the Further Assessment, required in order for the mean objective for nitrogen dioxide to be achieved is defined by the difference between the highest measured or predicted concentration and the objective level (40 µg/m^3). The highest NO_2 concentration at a relevant location is that modelled at 16 Worcester Road (R23) requiring a reduction of 14.9 µg/m^3 in order for the objective to be achieved.

However the Further Assessment explains that in terms of describing reductions in emissions required it is more useful to consider nitrogen oxides (NO_x) which has been calculated in line with guidance presented in LAQM.TG(09) (Defra, 2009). Table 3-14 below sets out the required reduction in local emissions of NOx in Worcester Road AQMA to achieve the annual mean objective at ten receptors where an exceedence was predicted in 2010. At 16 Worcester Road local emissions would need to have been 49.8 % lower in order to meet the objective.

Table 3-14 Required reduction in Annual Mean Nitrogen Dioxide Concentrations and in Emissions of Nitrogen Oxides at Receptors in the Worcester Road AQMA in 2010

Receptor Number	Receptor	Required Reduction in Annual Mean NO_2 Concentration ($\mu g/m^3$)	Required reduction in Emissions of NOx from Local Roads (%)
R12	**146 Worcester Road**	8.7	35.2%
R13	**144 Worcester Road**	8.1	33.4%
R14	**138 Worcester Road**	8.0	33.2%
R15	**161 Worcester Road**	8.6	34.8%
R20	**87 Worcester Road**	4.5	21.0%
R21	**76 Worcester Road (1st Floor)**	13.4	46.8%
R22	**85 Worcester Road**	6.1	26.9%
R23	**16 Worcester Road**	14.9	49.8%
R24	**11 Worcester Road**	8.7	35.0%
R29	**1 Hanover Street**	8.9	35.6%

The results highlight that targeting individual types of vehicle on these local roads in isolation would not lead to the annual mean objective being achieved unless the reductions are very large. This is primarily because the background concentration, which is not influenced significantly by very local emissions, contributes a large proportion of total nitrogen dioxide concentrations. Reducing total vehicle emissions by between 25% to 50% would be a potentially effective measure for achieving the objectives at most receptor locations.

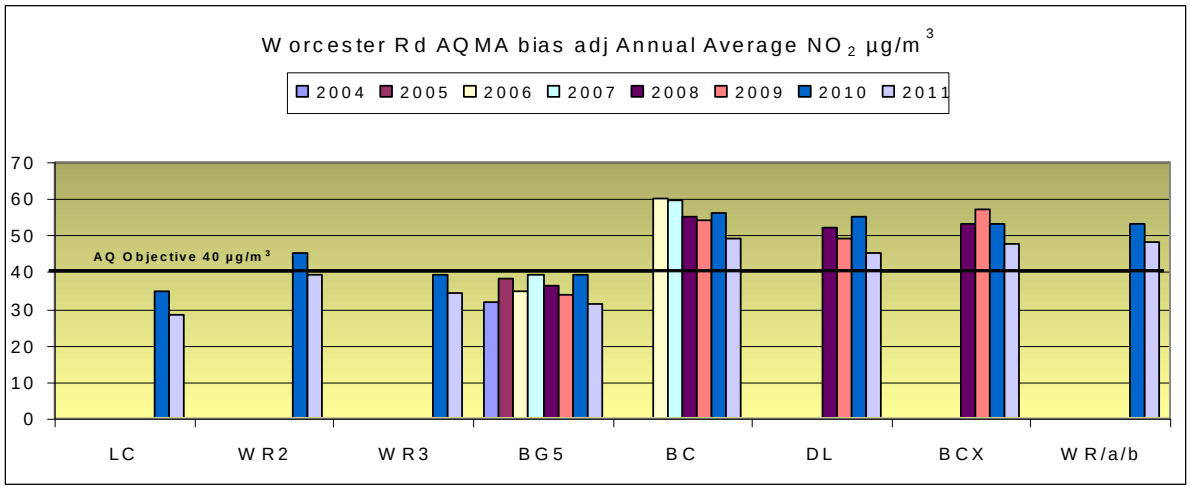
Measures within the Action Plan need to be proportionate to the scale of the exceedence of the objective and the number of people affected. In this case, 10 to 100 people are subject to exceedences of the annual mean objective (AQC, 2012b) and the magnitude of the exceedence ranges are relatively large (4.5 to 15 $\mu g/m^3$ above the objective).

3.4.5 Long term local trends in NO2

As part of the AQAP process data has been collated from previous BDC yearly progress reports and screening assessments to produce meaningful picture of long term trends in monitoring results of nitrogen dioxide in Worcester Road.

The graph below depicts these long term trends from bias adjusted annual average results of NO_2 at relevant exposure receptor locations.

Figure 3-11 Bias adjusted annual average NO2 monitoring results Worcester Road AQMA 2004 - 2011



3.4.6 Summary of progress of actions identified or implemented to date

No previous action plans have been produced for the Worcester Road, Bromsgrove AQMA.

3.4.7 Actions identified from Local Transport Programme 3 (LTP3):

A number of actions have been identified within the County Councils transport strategy as having a potential impact on Worcester Road AQMA. The LTP3 scheme code, brief description and current status as provided by WCC in February 2013 is shown in Table 3-15.

Table 3-15 LTP3 actions impacting Redditch Road AQMA.

LTP3 Scheme	Description of Improvements	Current Status
BR1 - Bromsgrove New Station Scheme	Indirect: Will allow longer trains to call at station, increased public transport capacity, increase to 350 car parking spaces	Public consultation underway. Programme date for opening 17th May 2015.
BR2 - Bromsgrove Eastern Bypass Enhancement Scheme (including AQMA remediation)	Directly Linked to AQMA: A package of enhancement measures, including major junction improvements and measures to improve accessibility to the railway. Integrated with other schemes in Bromsgrove	One of options for Bromsgrove Transport Package. No decision on what package will entail.
BR3 – Bromsgrove Town Centre Public realm Enhancement Scheme	Indirect: This proposed scheme would involve a package of Public Realm Enhancements in Bromsgrove Town Centre and would be integrated with other schemes in the area.	Awaiting more information from WCC on this scheme

LTP3 Scheme	Description of Improvements	Current Status
BR4 - Bromsgrove Traffic and Parking Management Study	Indirect: Study would identify where to focus investment to improve the operation of the local transport network.	One of options for Bromsgrove Transport Package. No decision on what package will entail.
BR5 - Bromsgrove Minor Transport Improvements Scheme	Indirect: Minor complimentary transport improvements to enhance safety, accessibility, information and travel choice.	One of options for Bromsgrove Transport Package. No decision on what package will entail.

3.4.8 Summary of key issues identified from review for consideration within actions

Issue WR1 - The northern extent of the AQMA is immediately south of the Bromsgrove Town Centre, a superstore and bus station and connects to the A448 Kidderminster Road.

Issue WR2 – Extension of the current boundary of the AQMA to include 1 - 10 Worcester Road is recommended by AQC within the Further Assessment. Furthermore the boundary could be amended to comply with Defra and EPUK guidance e.g. along physical or administrative boundaries and exclude rear residential garden areas and open fields not representative of relevant exposure.

Issue WR3 – The zebra crossing at the Hanover Street/Worcester Road bend can cause congestion in either direction.

Issue WR4 – Worcester Road narrows in two places where the facades of residential properties are in close proximity with the roadside creating street canyons; for 80m from the bend at the top of Worcester Road and further south in the vicinity of the Turks Head PH.

Issue WR5 - There are three school campuses adjacent to the AQMA and five more within the vicinity and accessible from Worcester Road. School traffic contributes significantly to the amount of vehicles using Worcester Road.

Issue WR6 - Parked vehicles outside residential properties either side of the Turk Head PH was observed to cause some disruption to traffic flow in both directions. Worcester Road also narrows at this point and there is reduced capacity for two columns of traffic to comfortably pass parked cars.

Issue WR7 - There are bulbous kerbs on the south side of the Shrubbery Road junction possibly designed to dissuade vehicles from parking on this corner but maybe causing issue turning into this junction from the south.

Issue WR8 - There are pull-in parking spaces outside the One Stop convenience store, only enough for four or five vehicles, generally observed to be always occupied and thus not sufficient.

Issue WR9 - School and local traffic exiting right from Shrubbery Road junction towards the St Peters/Rock Hill roundabout was noted to occasionally cause congestion within Worcester Road.

Issue WR10 – The Sanders Road Industrial Estate and the Market Site car park at the northern extent is a potential redevelopment target within the Bromsgrove Town Centre Draft Area Action Plan.

Issue WR11 – An old bus fleet was observed to be serving the local communities via Worcester Road.

Issue WR12 - The results of modelling within the Further Assessment indicate that the annual mean nitrogen dioxide objective is only being exceeded at a number of properties along the street canyon sections of Worcester Road i.e. its middle and northern sections.

Issue WR13 – Source apportionment within the Further Assessment demonstrated that Cars and LGVs make up approximately 98% of the traffic volume on Worcester Road, and contribute 41.3% to the total concentration of NO_2. Despite making up a relatively small proportion of the total traffic volume (1.2% on Worcester Road), PSVs (buses) contribute up to 16.1%.

Issue WR14 - The results of Modelling within the FA indicate 10 to 100 people are subject to exceedences of the annual mean objective and the magnitude of the exceedence ranges from 4.5 to 14.9 $\mu g/m^3$ above the objective. Reducing total vehicle emissions by between 25% to 50% would be a potentially effective measure for achieving the objectives at most receptor locations.