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EN010012 – The Sizewell C Project

My reference: 20026568

Title – **A risk analysis of fine particulate matter, 2.5microns and smaller – (PM2.5) produced as a consequence of the Construction of SZC by EDF**

Summary

From House of Commons Library – Brexit and air quality – CBP8195 May 2019
"Poor air quality is considered by the Government to be the 'largest environmental risk to Public Health in the UK', with implications for human health, natural environment and the economy"

Considering the mega-scale of the SZC development and the extended time scale it will last, its effect on air quality on Suffolk will harm human health and the environment during the construction and perhaps for decades to follow. The Inspectorate should consider this with urgency, guided by the precautionary principle.

Air quality standards are controlled by the EU and UK Law, and whilst short temporary interludes of poor air quality might be overlooked, the Law requires regular monitoring of pollution levels. In Suffolk, Targets should be set for acceptable levels, and planned Actions for if they are exceeded. Suffolk Councils have statutory responsibilities to monitor air, but EDF should anticipate unacceptable levels of pollution, have Targets setting these levels, and a Plan of Action for if they are exceeded.

This report predicts general and local high levels of dangerous pollutants as fine particles which cannot be mitigated. Regulatory authorities in the UK and EU carefully distinguish between measurements of PM2.5s and PM10s. EDF makes some attempt to mitigate the larger PM10s but fail to prepare for the inevitable effects of the finer PM2.5s produced as a result of the project.

Just as Science awoke to the health implications of smoking, and of asbestos dust, we are now becoming more aware of the dangers of fine particulate matter, its health and economic costs. Vast amounts of scientific study, resulting in new UK / EU Laws, Directives and Regulations are now trying to manage this problem. Court cases resulting from individual deaths attributable to air pollution from Traffic – like the death of Ella Kissi-Debrah – will become more common. The recent Covid pandemic highlighted the connection between high pollution and increased transmission of the virus. The Climate change emergency is pressurising the Government to limit the future sale of petrol/diesel vehicles – all within the expected timescale of the SZC project. EDF and the Inspectors must be proactive and anticipate increased concern and control over air pollution originating from the internal combustion engine.
This air pollution - accredited with killing 40,000 people a year – also has an effect on the flora and fauna. Suffolk is awash with nature destinations, but most eminent is the RSPB Minsmere and the surrounding Sandlings. The site generated air pollutants with blow over the site boundaries and kill plants, poison standing water, and generally disrupt the ecosystem which has taken centuries to develop.

The emphasis of this report is namely PM2.5 and smaller. To the layman these are all small solid particles, but many exist in gaseous 'particles' too. The *National Emissions Ceilings Directives 2002 / 2016* set ceilings for:

- NOx – Nitrogen oxides incl NO2
- SO2 – Sulphur dioxides
- VOC – Volatile organic compounds

- NH3 - Ammonia

The *Air Quality Directive 2008* sets emission limits and deadlines for:

- NOx
- PM10s and also PM2.5s
- O3 – Ozone

Since they are all, in their own way, dangerous pollutants existing as particles which are smaller than 2.5 microns, they are generally described as components of PM2.5s or smaller.

In this report I try to use EDF traffic projections and Government emission standards to roughly calculate the total amount of these pollutants which will result from SZC's construction. The EU and UK concern about them is guided by the Transboundary effect – these pollutants do not remain in the locality in which they are generated, by are blown across local authority, national and international borders. What is generated at, and on route to Sizewell (eg lorry emissions) will be spread not only throughout Suffolk, but neighbouring counties. I will outline the Legislative duties of the Government later, but suffice to say it has future emissions targets to keep, and reporting of data (nationally and internationally), which will be jeopardised by the construction of SZC.

I will also highlight what EDF's plan has reported – mostly about PM10s – and point to weaknesses in their analysis, and suggest what EDF should be doing if the project is given approval.

Finally I add some details of my own measurements of baseline levels for pollutants in places in East Suffolk, which suggest that at times, we already have concerning levels of pollution, such that the construction of SZC would certainly put many towns and villages into the 'danger zone' for decades. One of the supposed merits of Nuclear Power is that after construction (and pay back for the CO2 created building of it), we would reach this (or near) net-zero in terms of Carbon – some people call it **'clean'** energy. Ignoring this *CO2 focus*, and turning to an *air pollution* focus, the construction will create harmful pollution, killing and debilitating people, and degrading the existence of local SSSI environments during the 15 years, the results of which will continue to harm them for decades after. The deaths, the respiratory problems, the rise in other life affecting conditions, the acidification and eutrophication of local water sources, all will continue for many decades thereafter.

There is a *structural issue* to the problem of the SZC development in relation to the rest of Suffolk, and all have a bearing on *roads, transport and the need to maintain good air quality.*

- Suffolk is a rural county with few trunk roads, but a wide network of small rural routes – excess traffic can easily become a problem.
- There is a deficit of public transport around the county, and people depend on using their cars to access food, education, health – disruption of traffic jams could bring chaos.
- Housing pressures are leading to developments in Suffolk which already have inadequate transport connections / infrastructure. Jobs and Hospitals are long distances away. New Housing developments are already leading to an increase in traffic flows.
- One of the main money streams comes from Eco-tourism, and including second homes. RSPB Minsmere attracts people from all over the UK. Sailing and walking / cycling are important leisure activities. All rely on a healthy environment.
- Higher Education opportunities are mainly available at a distance – Ipswich in the south, Norwich and Lowestoft in the north. These are already busy commuter routes in rush hour.
- The nearest sizeable town of Leiston, with plenty of elderly people, young people and a school are poorly connected to main trunk roads, and close enough to suffer from locally generated wind borne pollutants. They will continually suffer from poor air, and access to good health facilities / hospital (Ipswich) is not going to be aided by heavier traffic levels. Their egress from this area is already an issue with an inadequate Emergency Plan, should evacuation be required; this will be

made worse during construction and its excessive traffic levels. Leiston would be a certain candidate for an AQMA (air quality management area)

The precautionary principle suggests that knowing of a real problem facing air quality in Eastern Suffolk (if not wider), actions need to be taken to avoid it, minimise it and mitigate it. EDF, the developers of this site, need to address these issues, suggest remedies, and be held to account for exceeding air quality ceilings.

I have listed some mitigation and compensatory features in section 7 for your consideration.

List of contents -

Sections in this submission: (submission starts P 4)

1. What are PM2.5s? What do they comprise / contain?

PM – or Particulate Matter – emissions are small particles in the air.
We talk about dust and grit in the air which as a result of transport and construction activities are usually visible, and which can be mitigated by masks and filters and activities like water spraying, which are described in guidance for building & construction.
The PMs to which I refer are the smaller and often invisible particles – PM2.5s, PM1s or even nano-particles.

Airborne particulate matter is made up of a collection of solid and/or liquid materials of various sizes that range from a few nanometres in diameter (about the size of a virus) to around 100 micrometres (100 µm, about the thickness of a human hair). It consists of both primary components, which are released directly from the source into the atmosphere, and secondary components, which are formed in the atmosphere by chemical reactions. Particulate matter comes from both human made and natural sources. It contains a range of chemical compounds and the identity of these compounds provides clues to its origin (see Tables 1 and 2). Measurements of the concentration of particulate matter in air are made by recording the mass of particulate matter in one cubic metre of air, using the units micrograms per cubic metre, µg m–3. Particulate matter is classified according to its size and this classification is used in concentration measurements. For example, PM10 is – to a good approximation – the concentration of particles that are less than or equal to 10 µm in diameter; similarly PM2.5 describes the concentration of particles that are less than or equal to 2.5 µm in diameter
(Air Quality Expert Group – Particulate matter in the Uk – DEFRA 2005)

The AQEG lists in detail the components of these particulates. Some are natural, but the harmful components are not (in excessive amounts in the human body).

- Elemental Carbon – originating from the incomplete combustion of fuels – incl. Diesel and petrol)
- trace metals – incl. from mechanical abrasion such as vehicle abrasion and tyre wear
- minerals – from wind driven dusts caused by excavation
- sulphates – incl. Sulphur dioxide, reacting with Ammonia to produce ammonium sulphate. Like nitrogen dioxide, sulphur dioxide can create secondary pollutants once released into the air. ... Secondary pollutants formed with sulphur dioxide include sulphate aerosols, particulate matter, and acid rain.
- nitrates – oxidation of nitrogen oxide, and variants reacting, producing ammonium nitrate. Nitrogen dioxide is part of a group of gaseous air pollutants produced as a result of road traffic and other fossil fuel combustion processes. Its presence in air contributes to the formation and modification of other air pollutants, such as ozone and particulate matter, and to acid rain.
- water – incl. Ammonium nitrates and sulphates
- Organic carbon – from traffic and industrial processes. Incl. Volatile Organic Compounds (VOC) some of which are highly toxic.
- Gaseous ammonia (NH_3) is the most abundant alkaline gas in the atmosphere. ... The largest source of NH_3 emissions is agriculture, including animal husbandry and NH_3-based fertilizer applications. Other sources of NH_3 include industrial processes, vehicular emissions and volatilization from soils and oceans.

Primary particles are released into the atmosphere from a number of stationary and mobile sources. The major mobile source is road transport, which produces primary particles when fuels are burned or lubricants used up in the engine, when tyres and brakes wear down and from road dust. The main stationary sources are the burning of fuels for industrial, commercial and domestic

purposes. Emissions of dust can also generate high concentrations of particulate matter close to quarries and construction sites. Primary particles can also be produced from natural sources, for example sea spray and dust from the Saharan desert travelling vast distances. Secondary particulate matter is formed from chemical reactions of the gases NH3, SO2 and NOx released into the atmosphere .
(Air Quality Expert Group – Particulate matter in the Uk – DEFRA 2005)

In previous decades, we have been more concerned with the visible PMs, and their mitigation, largely unaware of the health damaging effects of the smaller particles, and our inability to mitigate against them.

PM1 particulates – these are much smaller than the PM2.5s and have a greater ability to penetrate all organs of the body. In medical harm terms, they are much more dangerous than PM2.5s because they are smaller. PM1's have not been measured or considered by the EDF baseline studies, and only recently have sensors been accurate enough to quantify them. My sensor does measure them. Diesel engine emissions are considered the primary source and WHO classified them as carcinogenic in 2012. They also contribute to deadly diseases like heart attacks, lung cancer, dementia, emphysema. Chinese studies of air pollution in 65 cities, found that 10-ugm/m3 increases in PM1 particulates resulted in a 0.29% increase in cardiovascular disease, which was 21% higher than the risk related to PM2.5s. The mean daily concentration in all Chinese cities studied was 42.5 ugm/m3 - I had a reading of 13.7 on a damp December day in **Yoxford**.

Nitrogen Dioxide – NO2 – is a gaseous air pollutant composed of nitrogen and oxygen and appears as variants of nitrogen oxides – Nox. It forms when fossil fuels (incl. diesel) are burned at high temperatures. They contribute to particle pollution and to chemical reactions making Ozone. It causes a range of harmful effects when breathed, and shortens people's lives.
Cars, trucks, and buses are the largest emitters, followed by power plants and diesel powered heavy construction equipment – all of which will be found in any Sizewell C construction.

2. Where do PM2.5s originate - (a) exhausts (b) tyres and brake pads

Micro particles – <PM2.5 and PM1s – are caused by / produced by

- vehicle exhausts – incomplete combustion products
- brake pad/shoe wear – eroded particles shed on braking
- tyre wear – 'rubber' particles shed continuously

a) exhausts - diesel engines are notoriously unclean emitters of PM2.5 particles, as well/including the visible fumes and soot when poorly maintained. Emission standards have been tightened over the years, and Euro6 is the latest standard which emits less, but is still a net emitter of PM2.5s. Road vehicles are subject to MOT testing which penalises emissions above legal standards. However, construction sites have vehicles which are transported to sites, and do not come into contact with roads, and the required MOT standards. Construction plant includes static diesel generators as well as large and small excavation and transportation vehicles which operate most of the day. The emissions of this plant is not accounted for by EDF in either their traffic projections nor in the PM2.5 emissions that they produce. London studies show that construction sites are responsible for -

- 7.5% NOX emissions
- 8% PM10 emissions – NB. These larger particles can partially be mitigated on site.
- 14.5% PM2.5 emissions – which are more deadly and cannot be mitigated in the normal way.

There are Health costs associated with this pollution – 40,000 annual deaths and up to £20 billion costs (Royal College of Physicians - https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution)

b) tyres and brake pads -

Tyre wear - However a vehicle is propelled – diesel, petrol or even electric – they will have tyres and brakes which will erode and leave particles by the roadside.

Air pollution from car tyres can be up to 1,000 times worse than from an exhaust, research from Emissions Analytics has suggested.

Non-exhaust emissions (NEE) are expected to rise from 7.4% today to 10% of all UK PM2.5 emissions by 2030, in part due to increased regulations on exhaust emissions as well the further take-up of electric vehicles (EVs).
*Last year, the **Air Quality Expert Group (AQEG)** raised the alarm and warned that urgent action must be taken to cut emissions from tyres and brakes.*
To understand the scale of the problem, testing firm Emissions Analytics performed some initial tyre wear testing using a popular family hatchback running on brand new, correctly inflated tyres, which found that the car emitted 5.8 grams per kilometre of particles.
Compared with regulated exhaust emission limits of 4.5 milligrams per kilometre, the completely unregulated tyre wear emission is higher by a factor of over 1,000.
Emissions Analytics believes that this could be even higher if the vehicle had tyres which were underinflated, or the road surfaces used for the test were rougher, or the tyres used were from a budget range, all very recognisable scenarios in 'real world' motoring.
Richard Lofthouse, senior researcher at Emissions Analytics said: 'It's time to consider not just what comes out of a car's exhaust pipe but particle pollution from tyre and brake wear. Our initial tests reveal that there can be a shocking amount of particle pollution from tyres – 1,000 times worse than emissions from a car's exhaust.

'What is even more frightening is that while exhaust emissions have been tightly regulated for many years, tyre wear is totally unregulated – and with the increasing growth in sales of heavier SUVs and battery-powered electric cars, non-exhaust emissions (NEE) are a very serious problem.'

……

In January, a King's College London study suggested that fine particulate matter (PM2.5) that originates from brake pads may be just as bad for the lungs as PM2.5 from diesel exhausts.

Air Quality News.com – March 2020 - (but my under lining and bold)

I will use the figure of 5.8gms/km later. Note it is an idealised figure for a small car with newish, properly inflated tyres, and a severe underestimate when applied to larger vehicles, with less efficient tyres.

For many years, the focus on particulate matter (PM) pollution from vehicles has been largely on what comes out of their exhaust pipes. However, increasingly stringent Euro Standards legislation has reduced these to the point that the ***Government's Air Quality Expert Group (AQEG****) estimates exhaust PMs are now lower than 'non-exhaust traffic-related particles'. And with the growing uptake of electric vehicles likely to accelerate this trend, the focus on non-exhaust emissions (NEEs) is increasing. These are generated from sources such as brake, tyre, clutch and road surface wear, or already exist in the environment as deposited material which becomes airborne due to traffic-induced turbulence.*

The ***AQEG*** *says these directly contribute to more than half of particle pollution from road transport.*

"It is estimated the non-exhaust component will increase in importance, growing from less than 8% of national emissions in 2017 to 10% in 2030," it adds.

Non-exhaust emissions' impact on the environment

AQEG *also predicts that if no measures to restrict NEEs are introduced, they will, by 2030, contribute to 94% of total UK road transport emissions of PM10 (particulate matter up to 10 micro-meters in size) and 90% of PM2.5*

Half of all non-exhaust emissions occur on urban roads, owing to the greater braking per kilometre than on non-urban roads, while tyre wear emissions are estimated to be greatest on high-traffic trunk roads and motorways.

The risks to health of poor air quality have been well documented, with research by the Royal College of Physicians finding that around 40,000 deaths each year are attributable to exposure to outdoor air pollution.

PM, together with other air pollutants such as nitrogen dioxide, has been found to damage lung development in children and worsen existing respiratory and cardiovascular conditions, particularly in older people.

Department for Environment Food and Rural Affairs (Defra) figures show that road transport is responsible for 12% of the UK's particulate emissions, with 38% from burning wood and coal in domestic open fires and solid fuel stoves, 16% from industrial combustion and 13% from solvent use and industrial processes.

"We know that some of the components from brake wear, together with microplastics from tyres, will be irritating and cause reactions in the lung, which, over time, would not be good for our health," says Frank Kelly, of King's College London.

500,000 tonnes of plastic into the air

Microplastics from tyres – referred to as tyre wear road particles (TWRP) - are fragments of plastic below 5mm in diameter which are created when the surface of a tyre is abraded by contact with the road surface. Research from the MDPI's International Journal of Environmental Research and Public Health found that each car tyre weighs around 1kg less when scrapped then when first bought. It this is extrapolated across the 290 million cars in Europe, this equates to about 500,000 tonnes of material a year.

While the smaller particles (PM2.5 and PM10) are liable to become airborne, the larger particles will typically remain on the road surface until washed off in drainage water. "These are sausage shaped, can be between four and 350 micrometres in diameter, and on average they are found to be about 100 micro-metres," says Susanne Buchholz, head of global standards at Continental. "They are also denser than water, and this is why they tend to sink to the ground as sediment."

Continental is one of 11 leading tyre manufacturers which make up the Tire Industry Project, formed in 2005 to identify and address the potential health and environmental impacts associated with the lifecycle impacts of tyres. Part of its research has included a watershed analysis for the area around France's River Seine to calculate how much TWRP reaches the oceans."Not a large percentage of these particles actually reached the estuary because they settle before, so 2% to 5% have the potential to go further to the ocean," says Buchholz.

The research found 61% of TWRP (tyre wear road particles) ended up in soil, 18% was removed through road treatment, rainwater management and road sweeping, 18% stayed in surface water, 2% remained in the atmosphere, and 1% was deposited on road surfaces.

However, these findings are at odds with the positions taken by other organisations. An estimate from the International Union for Conservation of Nature and Natural Resources is that the erosion of tyres while driving contributes 28% of the release of primary microplastics to the world's oceans. This estimate makes TWRP at least as important as plastic bottles, bags and fibres released from clothing during washing, says the organisation.

One issue when it comes to reducing NEEs from tyres is that they are a necessary side-effect of road safety – the abrasion which creates them is required to ensure vehicles can both grip the road and slow down.

So how can they be tackled?

***AQEG** says the most effective mitigation strategies are to reduce the overall volume of traffic, lower the speed where traffic is free-flowing (e.g. trunk roads and motorways) and promote driving behaviour that reduces braking and higher speed cornering.*

The impact of driver behaviour

Research by Continental found that the biggest influencing factor on TWRP generation is driving behaviour, which, it says, has an effect five times larger than the tyre material, vehicle or climate.

***AQEG** says the resuspension of particles from the road surface can be lowered by reducing the material that is tracked on to public roads by vehicle movements in and out of construction, waste management and similar sites, as well as potentially by road sweeping, street washing and the application of dust suppressants to street surfaces.*

(https://www.fleetnews.co.uk/fleet-management/particulate-matter-emissions-not-all-about-exhausts) sept 2019

Nitrogen Dioxide - It forms when fossil fuels (incl. diesel) are burned at high temperatures. They contribute to particle pollution and to chemical reactions making Ozone. It causes a range of harmful effects when breathed, and shortens people's lives.
Cars, trucks, and buses are the largest emitters, followed by power plants and diesel powered heavy construction equipment – all of which will be found in any Sizewell C construction.

3. What are the implications for the health of :

(a) humans (construction workers and residents)?
(b) flora and fauna?

The Government site – Public Health England – Public Health Profiles, gives data on various aspects of Health. On the regional section – East of England – showing "fraction of mortality attributable to particulate air pollution" for 2017/18 we were clearly third in mortality (behind London and the SE), and similarly third in "Air pollution – fine particulate matter". Thus before any consideration of the construction of SZC, Eastern England already 'suffers' a widespread high value of pollution and mortality resulting from it. A further display of the mortality data shows us having above average mortality since 2010. **Air pollution is a pre-existing problem resulting in above average health problems, and has been for 10 years.**

Simply, Humans and Fauna breathe air which contains the airborne pollutants. The PM2.5s are so small that they are carried in the air and distributed by wind.
Flora do not respire in this way, but suffer from 'dry' deposition of fine dust on leaves, some of which may blow away in the wind. They also suffer from 'wet' deposition 'in solution' which has a more pernicious effect (than dry) because it can enter the pores of the leaves as a liquid.
Ponds and pools such as at RSPB Minsmere will suffer from 'dry' dust settling on the water surface and 'wet' solutions entering the water, polluting fish, and birds eating them.

In the last decade we have become aware of the damaging effect of fine particulates and are able to measure their quantity of emissions, and the medical effects that they have. Obviously the most serious health effects affect the most vulnerable – those with pre-conditions of lung and heart – but we are now learning that PMs are affecting all of us, and reducing our life span.
PM2.5's enter the lungs and thence into the blood stream. They are able to take their toxic content to any part of the human body, which is why PM 2.5 exposure is known to be associated with all medical conditions, especially the heart, lungs, and brain.

Particles cause the most serious health problems among those susceptible groups with pre-existing lung or heart disease and/or the elderly and children. There is evidence that short- and long-term exposure to particulate matter cause respiratory and cardiovascular illness and even death. It is likely that the most severe effects on health are caused by exposure to particles over long periods of time. However, UK estimates indicate that short-term exposure to the levels of PM10 that we experienced in 2002 led to 6,500 deaths and 6,400 hospital admissions being brought forward that year, although it is not possible to know by what length of time those deaths were brought forward. Work published by the Committee on Medical Effects of Air Pollution (COMEAP) in 2001 also indicates that for each 1 µg m–3 decrease in PM2.5 over the lifetime of the current population of England and Wales, between 0.2 and 0.5 million years of life will be gained. This is equivalent, on average, to 1.5 – 3.5 days for every individual in England and Wales.
(Air Quality Expert Group – Particulate matter in the Uk – DEFRA 2005)

Note that DEFRA's report is from 2005 citing evidence from 2001 – much more evidence has been collected in the intervening 15yrs, and legislation enabled.

- Vehicle MOT's are more rigorous in their emission standards
- European Standards have raised the acceptable minimum levels of vehicle emissions.
- Internal combustion engines – petrol and diesel – will not be produced in the near future (2030?)

- Wood burning stoves and coal burning fires/boilers will stop being produced in the very near future and there is impending legislation on the quality of fuel.

Much of this legislation comes as a result of modern approaches to the control of small particulate matter, and its consequent health implications.

Public Health England – reducing air pollution over the next two decades [NB – construction period of SZC] could prevent 50,000 cases of heart disease, 16,500 strokes, 9,000 cases of asthma and 4,000 lung cancers. And also reduce the burden on the NHS / Social care system.
[Govt report - Prevention is better than cure 2018]

Fine particulate pollution is now being studied further and research has identified the association of air pollution and its effect on Children's intelligence – both pre-natal and post-natal.
UNICEF - [*https://www.unicef.org/sites/default/files/press-releases/glo-media-Danger_in_the_Air.pdf*] warn of the impact of PM2.5s on the brain and cognitive function, warning that we need to reduce children's exposure to them. A simple Google search on 'pollution effect on children IQ' brings your attention to many academic studies of the topic. Schools in the immediate vicinity of SZC – Leiston, Saxmundham and beyond will be affected by the transboundary pollution from the site. A strategy needs to be developed to warn schools and parents in the area of any mitigation they can take.

With these particulates being spread around the Suffolk road network, they will affect -

- all pedestrians – especially children in buggies [being closer to dust].
- All vehicle drivers – in-car pollution is higher inside cars (even with windows closed) as the ventilation system draws more pollutants into the vehicles.

Some relevant legislation -

EU mandatory standards for Nox – 40ug/m3 – legal challenges
US standard for PM2.5 – 12ug/m3 – set in 2012
WHO standard for PM2.5 – 10ug/m3
Air quality standard for England, Wales, NI is 20ug/m3 {until recently 25]but 10ug/m3 in Scotland.

Clean Air Act 1956 as a response to smogs.
COMEAP – UK Cttee on medical effects of air pollution – in 2010 all-cause mortality increased by factor of 1.01 to 1.12 for every 10ug/m3 excess in average airborne PM2.5 concentration. That is a 6% increase in all cause mortality, and reduction of 6mths life expectancy for all. 30,000 early deaths per year.
60% of effect of air pollutants on mortality due to ischaemic heart disease
Environment Act 1995 – National Air Quality Strategy – local authorities required to measure and assess air quality in their areas. By 2000 there were 87 monitoring stations and the Low Emission Zone in London. After 20 years of monitoring and progress standards were not met in 37/43 areas in the Uk. The Independent suggested in 2017 " in the UK air pollution is deadlier than half of Europe".

Diesel engines account for 5% of all UK emissions.
(Every Breath you take – Mark Broomfield PhD 2019)

b). Implication of PM2.5's on Flora and Fauna

from Air Quality Expert Group – Defra – 2012 pages 12 onwards section 1.3.2
my notes from it -
1. PM2.5s can exist in liquid form on leaves which can affect the transpiration of leaves/plants. The drought tolerance of trees may be affected leading to regional die-back. Note use of term **regional** as this is not a localised effect.
2. PMs as aerosols - long range vectors of air pollutants in form of Ammonium sulphate and Ammonium nitrate, which lead to acidification and eutrophication of natural ecosystems
[Eutrophication, dystrophication or hypertrophication, is when a body of water becomes overly enriched with minerals and nutrients which induce excessive growth of algae. This process may result in oxygen depletion of the water body after the bacterial degradation of the algae.
Wikipedia]
3. Fine PMs associated with **long range transboundary** transport of pollution. 43-46% of UK pollution by sulphur and nitrate contributed by non-UK sources – which means fine PM pollution is not a localised effect limited to immediate area of pollution emission
4. For terrestrial habitats, 54% of natural ecosystem currently estimated to exceed critical loads for acidity. Nitrogen deposition exceeds critical load in 58% on UK sensitive habitats.

The Sizewell area – both in the immediate site where EDF plan to operate, and more regionally, the East Suffolk Coast, including RSPB Minsmere include sites of rare and sensitive ecosytems.

From **Suffolk Biodiversity Information Service**

"In Suffolk there are over 1,100 designated sites, which include sites designated at Local, National and International levels. There are 149 ***Sites of Special Scientific Interest (SSSIs)*** *in Suffolk across 283 polygons which equates to an area equivalent to 8% of the county or 31,326 ha (see map 1). These sites are designated by Natural England with some of the best examples also designated as* ***National Nature Reserves (NNRs)****. Suffolk also features 36* ***Local Nature Reserves (LNRs)*** *across 55 polygons covering an area of 463 ha and these sites represent places with wildlife or geological features that are of local interest.*

Large portions of Suffolk are also within European designated sites, see map 3. ***Special Protection Areas (SPAs)*** *together with Special Areas for Conservation (SACs) were born from the Birds and Habitats Directives and form a network of protected sites across the EU known as Natura 2000. SPAs designated for their bird interest cover 27,404 ha of Suffolk (over 7%) and SACs designated for their significant habitat interest cover 6,385 ha of Suffolk (over 1 %). Suffolk also has RAMSAR sites, an international designation which recognises significant wetland habitat."*
Ramsar *sites [A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention. The Convention on Wetlands, known as the Ramsar Convention, is an intergovernmental environmental treaty established in 1971 by UNESCO, which came into force in 1975.Wikipedia]*

Such regional pollution from fine <PM2.5s could create havoc in these special sites. They may already be coping with excessive loads, from UK and beyond, but the SZC project could push them over the edge of survival.

PM1 particles - They also contribute to deadly diseases like heart attacks, lung cancer, dementia, emphysema. Chinese studies of air pollution in 65 cities, found that 10-ugm/m3 increases in PM1 particulates resulted in a 0.29% increase in cardiovascular disease, which was 21% higher than the risk related to PM2.5s.

NO2 emissions - It causes a range of harmful effects when breathed, and shortens people's lives. It is associated with increased hospital admissions for all respiratory function.

4. What quantities of <PM2.5s are involved. What is the scale of the problem?

Here, I try to make some calculations based on figures supplied by EDF traffic projections,

Table 10.4: Sizewell C early years summary trips – car

Modelled Hour	Car Park		Caravan Site*		Southern Park and Ride		Northern Park and Ride & A12 / B1122		Two Village Bypass		Sizewell Link Road		Freight Management Facility		Elsewhere*	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
06:00-07:00	58	19	141	30	11	0	15	0	11	0	31	0	10	0	2	2

p22 table 10.4 bk6 ES v2 ch10 -see also 10.5, through to 10.12

and pollution emission figures supplied by the RAC for annual MOTs.
I cannot quantitatively measure or calculate the emissions of PM1's as they are not currently measured and must assume to be subsumed in the PM2.5 calculations.
The standards for NOx emissions are listed below in a chart. Quantitatively they are a factor of around **ten** times the amount of PM2.5 emissions (eg 0.005 PM2.5, compared to 0.08 Nox, for a Euro 6 diesel)
I will proceed with the PM2.5 calculations.

Implications for residents and workers - Traffic projections

To put it simply, increases in traffic and construction vehicle activity, will increase PM2.5 levels which will harm the health of construction workers and the residents of Sizewell, Leiston and villages beyond, and all along the routes that suppliers and workers will use.

Traffic will increase with -

- lorries delivering plant and construction materials – we take a ball park figure of a maximum of 1000 heavy lorries a day which involves a trip there and a trip back (2)
- excavating machinery on site – heavy 'diggers' and more numerous smaller 'tipper trucks'.
- Park 'n rides would be constructed to take a capacity of 1000 cars (each) a day – again 2 trips though our traffic highways and lanes.

Emission projections – my calculations
I tried to anticipate the sort of scale of emissions that would result from large amounts of traffic, so without looking at EDF projections, and based on UK Emission Limits for vehicles:
Each month –

- 500 petrol vans - Euro 4 emission profile – travelling a round trip of 80km will produce **4.8 kg** Pm2.5, and **76 kg** Nox.
- Same number of E4 diesel vans will produce **24kg** Pm2.5 and **240kg** Nox
- 750 lorries of (newer) Euro 5 profile, travelling average of 160 km a day will emit **14.4kg** of PM2.5 and **518 kg** Nox.

(assumptions – most construction workers will not be driving new cars, and delivery vehicles will not be the latest Euro6 standard, and were travelling 6 days a week)
These poisonous emissions, exacerbating numerous medical conditions in local residents, will be spread around the road systems of Suffolk Coastal. Emissions are likely to more intense along small country roads where gear changes / acceleration/ braking are more common than during trunk

road journeys. Because of the rural nature of Suffolk, and lack of 'smooth' trunk roads this figures are likely to be underestimated.

Add to that there are PM emissions, not from exhausts, but from **tyre wear and brake pad wear.**

500 vans travelling 80km a day 6 days a week – creates **1,392kg** tyre dust pm2.5s a week
750 lorries travelling 160km a day 6 days a week – creates **2,784 kg** tyre dust pm2.5s a week
(data from Air Quality news com, based on figure of 5.8gm/km for new family car with new correctly inflated tyres).

Thus the quote from AQn that Pm2.5 emissions from vehicle tyres are "a thousand times worse" than from vehicle exhausts!

Using EDF traffic projections - listed in bk6 ES V2 ch12 Transport

EDF projections – – traffic per day

early years

cars table 10.4 – 1695
LGV table 10.5 – 125
HGV table 10.6 – 613
Bus table 10.7 – 182
The traffic figures are single journeys - 2615, so double this for return journey = **5230** trips
(NB EDF quote numbers of vehicles in and out – partly to show the times of day they are coming in and out – but each vehicle represents 2 trips – there and back, or it could be they are trying to minimise the numbers.)

peak construction

cars table 10.8 – 5046
LGV table 10.9 – 351
HGV table 10.10 – 965
Bus table 10.11 – 700
Coaches table 10.12 – 64
operational traffic table 1.13 - 827
The traffic figures are single journeys - 7953 , so double = 15906 trips

Mileages - How far is one journey?. EDF give no information - *my ball park figures to help calculations.*
car journeys are commuting construction workers – av. ball park figure 20mile / **32km** commuter
LGV delivery vehicles - av. ball park figure 50 mile / **80km** trip
HGV delivery vehicles - av. ball park figure 60 mile / **96km** trip
Bus – park 'n ride – Darsham 9 mile /14km trip, Wickham 13 mile /**20km** trip -
Coaches – likely to be local / East Anglia - av. ball park figure 20ml /**32km**
operational traffic – could be limited to site? Av **15km** a day
** these are daily figures)**

I am now in a position to calculate the emissions based on the number of km driven each day
early years – figures of miles driven for EDF per day
cars table 10.4 – 1695vehicles x32km = 54,240km per day
LGV table 10.5 – 125vehicles x 80km= 1,000km
HGV table 10.6 – 613vehicles x96km= 58,848km

Bus table 10.7 – 182vehicles x32km= 5824km

Thus - **total** estimated ball park **mileage** in km = **119,912 km** of particulate emissions **per day**, in early phase

peak construction - figures per day
cars table 10.8 – 5046vehicles x 32km = 161,472km per day
LGV table 10.9 – 351vehicles x 80km = 28,080km
HGV table 10.10 – 965vehicles x 96km = 92,640km
Bus table 10.11 – 700 vehicles x 32km = 22,400km
Coaches table 10.12 – 64vehicles x 32km = 2,048
operational traffic *table 1.13* – 827vehicles x15km= 12,405

Thus - **total** estimated ball park mileage in km = **319045 km** of particulate emissions **per day**, in peak phase.

Let's convert this to grams/km of particulate emissions per day **from exhausts** -

I have assumed all vehicles are Euro 5 standards. Some new lorries will be Euro6, but many of the smaller local lorries and the construction workers may be Euro4
I have taken EDF traffic figures in/out of site, and doubled to show return journey, and used my ball park figure of mileage travelled for each vehicle.

Here is the table of emissions produced by RAC data

RAC table	pm2.5		nox	
	petrol ug/km	diesel ug/km	petrol g/km	diesel g/km
Emissions – euro6	0.005	0.005	0.06	0.08
emissions – Euro5	0.005	0.005	0.06	0.18
emissions – Euro4	0.005	0.025	0.08	0.25
emissions – Euro3		0.05	0.15	0.5
emissions – Euro2		0.08	0.5	0.7

So to work out what will be emitted – we know the miles, we know the emission data.

During the **early** years

- Cars – construction workers – 54240 km results in **271.2 grams a day PM2.5**. And between **3254.4 and 9763.2 grams** NOx (depending on whether they are petrol or diesel).

That is a total PM2.5/Nox emission of between **3.5 to 10 KG** per day

- LGV etc – deliveries – 65672 km day results in **328 gm PM2.5** and between **3,940gm and 11,821gm NOx** (depending on whether they are petrol or diesel but probably diesel the upper figure).

That is a total of PM2.5/Nox emissions of between **4.3kg and 21kg a day**

During **peak** construction

- Cars – construction workers – 161472km results in **807.4gm a day PM2.5**. And between **8500.3gms and 290,651gms NOX** (depending on whether they are petrol or diesel).

That is a total of PM2.5/Nox emissions of between **9.3kg and 291kg per day**

- LGV etc – deliveries – 145,168km results in **725.8gms a day PM2.5.** And also between **8710.1gms and 26,130.2 gms Nox** per day (depending on whether they are petrol or diesel, but probably diesel, the upper figure).

That is a total of PM2.5/Nox emissions of between **9.3 kg and 26.1kg per day**

- Also the operational traffic – (assuming these are largely stationary10km a day, but probably working with engine on/polluting much of the day- 827 vehicles @10km=8270km. Resulting in a minimum of **40gm PM2.5 and Nox between 40-1440gms a day** (probably diesel at the upper level).

That is a total of **80gms – 1.5kgs PM2.5/NOx a day,** but likely to be a lot more

It's difficult to judge the emissions of on-site Plant (mostly diesel), and mileage is not indicative, but rather size of engine and number of hours a day (above), I calculate that mobile EDF vehicles will be emitting between **7.8kg and 31kg of PM2.5s** and Nox particulates **per day** in the **early** period.
During **peak** construction, I calculate that EDF vehicles will be emitting between **20kg and 315kg PM2.5s** and Nox particulates per day in the **peak** period.
These are figures for emissions per day, but SZC will be working 7 days a week, 52 weeks a year and the construction phase will last 10 years

Kg / day	kg/wk	kg/mnth	kg/yr	kg/10yr
7.8	54.6	218.4	2,616	26,160
31	217	868	10,416	10,4160
20	140	560	6,720	6,7200
315	2,205	8,820	105,840	10,58,400

So over the alleged 15 year period, the best we can hope for is 2.6 tonnes a year of dangerous pollutants being emitted per year, but at the worst it could be 105 tonnes a year!

These exhaust emissions are dwarfed by the particulate emissions from tyre wear and brake pad wear – see previous.

Heavy non-mobile plant -
Of course these quantities (above) are for the *mobile* traffic travelling to and from (and on) the site.
EDF do not appear to give statistics of the volume of heavy plant and cranes which will be delivered to the site and will remain working there for the 10 years of construction. Many of these are large diesel powered machines which probably do not conform to Euro6 standards because it is not applicable. For 10 long years they will be operating around the clock, and emitting vast amounts of invisible PM2.5s as well as lots of carbon rich sooty exhausts.
It is not an easy job to find emissions data for a typical 4.4ltr diesel backhoe loader, or a Perkins diesel!
Quantitatively, these emissions must surely be many factors higher than the estimates I have given for *mobile* traffic. The 105tonnes a year (see table above) could easily be increased by a factor of 5 or 10!

All of this pollution has to go somewhere, and it is unlikely to remain on site, but be dispersed across Suffolk.

The emissions are generally originating along the roadways of Suffolk, but such is the finest of the particles, that they are mobile and are blown by the wind away from roads into areas of human habitation and areas of sensitive flora and fauna, even beyond Suffolk.
Values of 'acceptable' levels of PM2.5 are already sometimes exceeding hourly, or daily or even weekly legal guidelines, dependent on Traffic, and Meteorology. The predicted amounts of emissions I have described will be a constant feature of the 12-15 yr predicted construction period, and are frightening.

5. What areas of Suffolk are affected – a localised or regional problem?

To put it simply, increases in traffic and construction vehicle activity, will increase PM2.5 levels which will harm the health of construction workers and the residents of Sizewell, Leiston and villages beyond, and all along the routes that suppliers and workers will use, and all the flora and fauna therein.

I will describe the geographical extent of these particles, and the timescale that they will be present in our area, along Trunk roads and A roads through our villages. Research into Trans-boundary dispersal of fine pollutants shows that these pollutants will not be localised along roadsides, but dispersed widely across Suffolk.

Main delivery routes, and affected towns -
A12 – Ipswich, Lowestoft – Woodbridge, Saxmundham – villages in between
A14 – Ipswich, Bury St Edmunds – villages in between
Main Commuting routes for Construction workers
A1120 – Stowmarket, Framlingham
A1094 - Leiston
A144 – Halesworth
All the rat runs to avoid congestion, through country lanes and small villages – too many to specify

From Suffolk Biodiversity Information Service -

In Suffolk there are over 1,100 designated sites, which include sites designated at Local, National and International levels. There are 149 Sites of Special Scientific Interest (SSSIs) in Suffolk across 283 polygons which equates to an area equivalent to 8% of the county or 31,326 ha (see map 1). These sites are designated by Natural England with some of the best examples also designated as National Nature Reserves (NNRs). Suffolk also features 36 Local Nature Reserves (LNRs) across 55 polygons covering an area of 463 ha and these sites represent places with wildlife or geological features that are of local interest.

County Wildlife Sites(CWS) are non-statutory sites which are of county, and often regional or national importance. The designation recognises the high value of a site for wildlife and they are often designated because they support characteristic or threatened species and or habitats included in Local or National Biodiversity Action Plans. In Suffolk there are 925 CWSs covering an area of approximately 19,683 ha which is over 5 % of the total area of the county (see map 2). Roadside Nature Reserves (RNRs) are also shown in map 2 and these represent good examples of species-rich plant areas and plants or other species of national or county importance. While most of these have CWS status others are legally protected (being within SSSI or having legally protected species). 30 places of geological interest in Suffolk are designated as County GeoSites; these non-statutory designations aim to highlight their local importance. Further information on Geosites is available on the Geosuffolk website
Large portions of Suffolk are also within European designated sites, see map 3. Special Protection Areas (SPAs) together with Special Areas for Conservation (SACs) were born from the Birds and Habitats Directives and form a network of protected sites across the EU known as Natura 2000. SPAs designated for their bird interest cover 27,404 ha of Suffolk (over 7%) and SACs designated for their significant habitat interest cover 6,385 ha of Suffolk (over 1 %). Suffolk also has 6 RAMSAR sites, an international designation which recognises significant wetland habitat.

Exhaust emissions produce particles which settle onto the ground alongside roads or blown a little way away. Tyre and brake pad wear particles are also placed along road sides. The particle problem is worse along all roads and therefore into homes, schools and office/institutions in all Suffolk villages and towns. Subject to wind, these particles can affect people some way beyond, and above, to road surfaces.

Exposure to Pm2.5 has no safe limit – all exposure has some effect. Countries set 'acceptable' limits, and 'average' and 'annual' limits. For example, if smoking is bad for you, one cigarette occasionally will do you no noticeable harm.
The construction of SZC is estimated to take at least 10 years, and going by their experience at Hinkley and Flammanville in France, this could easily be 15 years. Road traffic will not be at a maximum at the start and finish of the project, but we could conceive of an 8 – 10 year timespan when there will be a maximum number of construction workers travelling to the site, and a maximum number of lorries delivering to the site and working on site.
A continuous production of high levels of PM2.5s on a daily basis for this number of years will have noticeable effects, not only on the vulnerable, but on all residents of Leiston, Sizewell and villages and towns along delivery and commuter routes.

6. What have EDF failed to account for?

I will argue that EDF have failed to take the PM2.5 emissions seriously – if at all – in their 'modelling' exercises, and have only considered such emissions once the plant is being tested or operated – ie after construction, not during construction. They do not appear to consider the more (medically) dangerous PM1 particulates.

In their proposal, EDF have tried to account for PM2.5 emissions in the commission and normal occasional usage of their diesel generators, *after* the project has been completed. In the wider context of a completed power station, these emissions are indeed almost acceptable.

They catalogue mitigation for the larger dust particles during construction on site – vehicle washing and spraying, but these are standard techniques required by legislation for construction sites, and these particles are of a size which is visible and can be easily mitigated (PM10 and larger).

They do not account for smaller invisible <PM2.5s which are generated either on site or around the traffic routes and residential areas of Suffolk. This may be oversight, but also an acknowledgement that their mitigation is not easy.

In their 'Initial proposals Environmental report – (stage 1 pre-application) Nov 2012, EDF reported on Air Quality (p60 para 4.7). It describes how an initial baseline survey was done in conjunction with Suffolk CC admitting that "air quality emissions would arise from the construction and operation of" SZC, choosing some locations "around the site" and "along transport routes". Its emphasis was on monitoring NO2 emissions; PM10 data was only available from 1 of 12 sites ('no Data' being the commonest response!). No reference to PM2.5.

Throughout their documentation is a surfeit of statistics and charts suggesting 'baseline' values and fantasy projections of the future emission levels at certain locations. The baselines are measured from an existing quiet rural/coastal location with little traffic. After the analysis of the amount of traffic flow, and heavy plant operation which I have described, it cannot support the veracity of these predictions. See my baseline measurements in section 11 of this report.
If hundreds of tonnes of deadly pollutants are being spread across the site, the vicinity and the rest of Suffolk, EDF cannot claim the effect will be "negligible"!

EDF figures for traffic increases along various feeder route quote figures from 40% to 60% , then 278% to 547% changes in traffic, and talk about adverse effects, so presumably the air borne pollution by these increases cannot be considered 'negligible.

Table 10.14 : Severance 2023 Representative Hour (07:00-08:00) Total Traffic

Link Number	Link Name	2023 Reference case (total traffic in the hour)	2023 Reference + Sizewell (busiest) total traffic in the hour	% Change	Magnitude	Sensitivity	Effect Significance
11	B1125 through Westleton	235	375	59.6%	Low	High	**Moderate adverse**
13d	A1120	287	399	39.0%	Low	High	**Moderate adverse**
17b	B1125	191	319	67.0%	Medium	High	**Major adverse**
90	A1120 Sibton (east of Mill Hill)	272	383	40.8%	Low	High	**Moderate adverse**

Table 10.14 bk 6 v12 ch10 p35

Table 10.15: Amenity 2023 24hr AAWT HDVs

Link Number	Link Name	2023 Reference Case 24hr AAWT HDVs	2023 Reference + Sizewell (busiest) 24hr AAWT HDVs	% Change	Magnitude	Sensitivity	Effect Significance
1	Sizewell Gap	99	639	547%	High	Low	**Moderate adverse**
4c	B1122 (N)	212	812	284%	High	Medium	**Major adverse**
10	B1122 through Theberton	216	816	278%	High	Medium	**Major adverse**
13b	B1122	177	801	352%	High	Low	**Moderate adverse**
64	B1122 north of SZC access	216	816	278%	High	Medium	**Major adverse**
66	B1122 west of B1125	165	765	363%	High	Medium	**Major adverse**
74	B1122 (Middleton Moor)	177	777	339%	High	Medium	**Major adverse**

Table 10.15bk 6 v12 ch10 p41

Riddled throughout the EDF documents are charts which use the words 'negligible effect' when referring to the levels of PM2.5s [or any particulate] after their 'dust' suppression mitigations.
In Chapter 12 bk6 Air Quality, you will lose count of the number of alleged 'not significant' comments on the effects of their construction pollution, but they are focussed on the NO2 and PM10's which can be somewhat mitigated.

Table 12.10: Effect descriptors for annual mean $PM_{2.5}$.

Annual mean pollutant concentration at receptor in assessment year (µg/m³).	Magnitude of impact.				
	Imperceptible	Very low	Low	Medium	High
≤18.9	Negligible	Negligible	Negligible	Minor	Moderate
18.9–<23.6	Negligible	Negligible	Minor	Moderate	Moderate
23.6–<25.6	Negligible	Minor	Moderate	Moderate	Major
25.6–<27.4	Negligible	Moderate	Moderate	Major	Major
≥27.4	Negligible	Moderate	Major	Major	Major

12.3.28 Following the classification of an effect as presented in **Table 12.9** and **Table 12.10** at each individual receptor, professional judgement is used to determine the overall effect. A clear statement is made as to whether the overall effect of transport related impacts on air quality is 'significant' or 'not significant'. Major and moderate effects are considered to be

We are expected to consider their 'professional judgement' on whether effects are negligible.

My own readings -during lockdown/winter – show high values of PM10 on an ordinary day :

	23.0						26	
	55.0						0	
	28.0						4	
	73.0						72	
	19.0						32	
	28.0						3	
e AQI)	pm 10 (Plume AQI)	pm 2					14.9	
	24.3						72.0	
	73.0							
							3.0	

sizewell beach – average 24.3 / max 73 for PM10's

Theberton – average 14.9 max 72 for pm10's

2021-02-26 13:15:44	56.0	13.0	10.5	2.0	60.0	1.0	11.0
2021-02-26 13:16:44	53.0	12.0	30.1	3.6	58.0	1.0	30.0
2021-02-26 13:17:44	52.0	12.0	3.0	2.0	57.0	1.0	3.0
2021-02-26 13:18:44	50.0	11.0	32.4	3.0	56.0	1.0	32.0
2021-02-26 13:19:44	43.0	15.0	3.0	2.0	51.0	1.0	3.0
date (UTC)	**NO2 (ppb)**	**VOC (ppb)**	**pm 10 (ug/m3)**	**pm 2.5 (ug/m3)**	**NO2 (Plume AQI)**	**VOC (Plume AQI)**	**pm 10 (Plume AQI)**
avg	**51.1**	**18.7**	**8.7**	**2.2**	**56.7**	**1.5**	**8.7**
max	**57.0**	**38.0**	**32.4**	**3.6**	**61.0**	**3.0**	**32.0**

outside Yoxford school – average 56 max 61 - mid afternoon, ordinary quiet day – already high!

		NO2 (ppb)	VOC (ppb)	pm 10 (ug/m3)	pm 2.5 (ug/m3)	NO2 (Plume AQI)	VOC (Plume AQI)	pm 10 (Plume AQI)	pm 2.5 (Plume AQI)	pm 1 (ug/m3)	pm 1 (Plume AQI)	
	MAXimum											
Darsham		0	83	47.9	46.9	0	7	48	94	44	110	
westleton pond		0	160	16.6	2	0	13	17	4	1	3	
dunwich beach		0	71	131.4	22.7	0	6	132	45	12	29	AQI
dunwichheath		0	93	59.6	3.5	0	7	66	7	1	3	Moderate
sz		34	65	56	7.2	37	5	60	14	2	5	
roadpassenger		40	146	47.4	2.2	47	12	47	4	1	3	High
farnham		43	104	28.8	6.2	50	8	29	12	5	13	
wickham mkt		21	169	23.9	2	19	14	24	4	1	3	V.High
ststandrew		13	209	90.8	11	12	17	107	22	2	4	
yoxford		15	376	5.8	2	15	29	6	4	1	3	
Peasen		50	69	152.5	14.5	56	6	145	29	3	6	
Wangford		20	136	93.6	5.7	18	11	108	11	1	3	
Kenton		36	52	99.6	7.3	40	4	112	15	1	3	WHO >10ugm/m3
LeisRlwyYd		0	56	75.7	7.5	0	4	93	15	1	3	
LeisCoop		57	47	71.6	5.4	61	4	86	11	1	3	
Szroad		34	57	65.1	6.1	38	5	75	12	1	3	
Theberton		22	51	63.4	4.8	21	4	72	10	1	3	
Yoxroundabt		19	50	82.6	6.3	18	4	102	13	1	3	
MinsmereF		5	110	115.9	9.1	4	9	122	18	4	11	
MinsmereReserv		18	131	75.7	5.9	17	10	93	12	1	3	

Compilation – max values of pollution – during winter/lockdown – already PM10's regularly very high, NO2's fairly high, and PM2.5's approaching/peaking WHO levels of safety

I would suggest the current levels of air pollution are hardly negligible, and are significant, even before EDF traffic figures start to rise – early years or even peak project. *It is not true that there is no air pollution in East Suffolk*, (then argue that a little more from EDF will not make much difference). High levels of pollutants already exist for brief periods.

EDF see PM2.5's as a small variant of larger dust particles (PM10's and larger). Legislation clearly distinguishes the two. EDF do not seem to account anywhere, for the particulates created by vehicle exhausts and tyre/brake wear on vehicles servicing them. It is if EDF do not even taken responsibility for this massive regional pollution, they are so focussed on their own construction site.

Regarding the Construction site, and emissions of dust from excavations, let alone the emissions from construction vehicles.

From 12.2.8 *p4 BK6 ES ch12 vol2*

"The Institute of Air Quality Management (IAQM) guidance on construction dust (Ref. 12.17) describes the risk assessment for particulate emissions, from construction dust generating activities, including PM10 and the coarse dust fraction (dust soiling). However, there are no specific guidelines relating to the assessment of PM2.5.

Instead the IAQM guidance (Ref. 12.17) references PM2.5 as follows:

"*The most common impacts are dust soiling and increased ambient PM10 concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of dust in all size fractions. The ambient dust relevant to*

health outcomes will be that measured as PM10, although most of this will be in the coarse (PM2.5-10) fraction, rather than the PM2.5 fraction.
Research undertaken in the USA suggests that 85% to 90% by weight of the fugitive dust emissions of PM10 from construction sites are PM2.5-10 and 10% to 15% are in the PM2.5 fraction."

EDF minimise the importance of PM2.5s as they quote the IAQM as having no specific guidelines for them. This is true because the guidelines are for larger construction dust for which they generate large visible quantities, and are able to reasonably mitigate for them.

It is not correct for the IAQM to suggest that most of the health outcomes come in the larger particulates. The evidence is that the finer particles are more medically harmful, because they penetrate all body organs and cannot be mitigated.
They even try to confuse the issue by referring to the "coarse(PM2.5 -10) fraction" by a loose referral to 2.5s, trying to suggest they somehow similar. Legislation, Mathematics and Logic clearly define <PM10s as being smaller than 10 microns (but greater than 2.5 microns) and *different* to <PM2.5s which are smaller than 2.5 microns.
The issue of health is not limited to large dust particles, but especially to the smaller than PM2.5 particles (and more so to <PM1.0s – 1 micron). Defra and the AQEG make this very clear – (see my sections 1 and 3).
The quote about the weight of the emissions is significant. Well of course the larger particles are going to weigh more! PM2.5s and smaller, are virtually invisible to the naked eye. However if 10 to 15% of the emissions are PM2.5, this represents a vast amount of invisible poisonous particles being emitted. What are EDF doing about it? Where is the analysis of this vast problem, and what are they doing to mitigate it?

And also

"12.2.9 p4 BK6 ES ch12 vol2
The annual mean PM2.5 air quality standard value is considerably less that of the annual mean PM10 air quality standard value, and therefore, it is considered reasonable that where PM10 emissions from earthmoving activities and other construction activities (excluding combustion activities) do not exceed the annual mean air quality standard, the associated PM2.5 emissions from the same activities would not exceed the PM2.5 annual mean air quality standard. PM2.5 is therefore not specifically considered within the assessment, instead PM10 is used as a surrogate"

Again they try to conflate PM2.5s with PM10s. Because they know they can mitigate the bigger particles, they attempt to suggest that anything they do to the bigger particles will have a similar effect in reducing PM2.5 emissions. This is scientifically incorrect.
They further suggest that if their control measures keep PM10 emissions within 'air quality standards', then by surrogacy, it would bring the PM2.5 emissions within those standards. This is scientifically incorrect.
So that is why they feel the PM2.5s are not "considered within the assessment" – false Logic.

I am not quite clear about what they mean by the AQ 'standard value'. Do they mean they acknowledge the U.S. figures, that by weight the PM2.5s are lighter – seems logical.

The first quote – 12.2.8 – suggests that at least 10% of the total construction dust emitted by the project – could be 10's of thousands of tonnes – will be PM2.5.
The second quote – 12.2.9 – suggests that as they can do something about the larger particles, that mitigation of it will (by surrogacy?) bring down the quantity of PM2.5 particle emissions.

This is very poor logic and scientifically inaccurate. The vast quantities of very fine particles will still be produced. They will not and cannot be mitigated. They are harmful to health, and not just in the immediate area, but around the district and county. What are EDF going to do about this?

Other emissions projections in the EDF document:

EDF overwhelm you with figures in tables, and many of these figures are based on projections. One can first question the baselines that they project these figures from, and then one must ask how they project into the future, but such is their confidence that they are then able to project air quality figures at X and Y in 8 years time. And by careful selection of baseline values they are able to predict that there will be "negligible" or "imperceptible" changes. See – table 12.18 p41 V2 ch12 Air Quality, or table 12.9 p14 V2 ch12 NO2/PM10. See baselines – bk6 v2 ch12 appendix 12E. This is statistical sophistry on a grand scale.

They present masses of data for the Rail option, and for the Link Road, and for the Park and rides, and suggest for all of them there will be no, or negligible, or imperceptible change. This is because of the logic above – if there is very little PM10 dust here (which we have mitigated on site) there will be none here, and ipso facto, by 'surrogacy' there will no PM2.5s. There will be, because you do not and cannot mitigate for the vast quantities of PM2.5s on the construction site, let alone the emissions from lorries and vans and car's exhausts and tyre wear and brake pad wear, which I calculate elsewhere.

But the chart and tables that EDF publish show there will be no change, or not enough for anyone to be worried about.

Bk 6 v2 ch12 -12.3.12 - Receptors within the study area are selected on the basis of their proximity to emission sources, as follows:

EDF lists where and how they study the effects of the emissions:

within 350m of the development/construction site

50m from roadsides

200m from major routes like the A12 and A1122, and rail routes

And then chart 12.3 lists the possible effects of **PM10** dust – they ignore anything smaller. I live within 50m of a road route feeding Sizewell, and I am not worried about the PM10 dust, but rather the traffic PM2.5 emissions and the aerial transport of PM2.5s from the main site.

EDF fails to account, either partially or by omission, for either the widespread <PM2.5/NOx particulate emissions resulting from traffic or from the Construction Zone.

It fails to account for it because it has focussed on the larger dust particles which can be mitigated for, and it has by an attempt of association (of PM10 figures with PM2.5 figures), tried to ignore the problem.

It fails to acknowledge the problem.

It fails to mitigate the problem.

7. Possible mitigation for this problem (preventative and compensatory)

I will argue that any suggested mitigation of small particles is inadequate as they only consider larger particles that can be dealt with by washing/dust suppression. This is even seen in previous EDF practice; the Hinkley and Sizewell projects only describe mitigation for particles larger than PM10.

EDF makes comprehensive procedures for dealing with 'dust' – particles bigger than 10microns – PM10s. *See EDF bk1 vol1 Appendix 6H – in EIA Methodology 6D-6Y.* They do have tables – 1.6,1.7 – which acknowledge how they will describe NO2, PM10 [table 1.6] and PM2.5 [table 1.7] pollution levels [p28 Appendx 6H].
Dust is large and visible and can be mitigated after being produced in 'construction'.
PM2.5s – and smaller – are more difficult to deal with. They cannot be controlled on site by dust mitigation, and in fact, my study shows that much of the <PM2.5 pollution is created off site, along Suffolk roadways and villages, and beyond planned mitigation procedures.
PM2.5s produced by vehicle exhausts can only be partially mitigated by

- efficient filters on vehicles
- properly maintained vehicle maintenance with engines operating optimally
- properly inflated tyres
- good driving practice – sensible acceleration and braking, legal speed

PM2.5s produced by tyre wear and brake pad wear cannot be mitigated at point of creation. This particulate is going to be created, even if all vehicles were Electric.

EDF's focus is only on the site and the immediate land surrounding. They do not realise that their pollutants are Regional.

As previously suggested, the small size of these particles makes identification and mitigation difficult, but here are a few suggestions.

Monitoring – there are too few air monitoring sites in Suffolk, and EDF should set up a network of monitoring devices along the main routes that their delivery lorries and construction worker commuters use. They would then be able to identify periods of high emissions – whether due to excess traffic or environmental conditions – when traffic could be reduced to acceptable levels. As recommended by the AQEG 2012. Areas within the construction zones should be monitored at many points of emission, if only to facilitate where problems occur more rapidly, and save time for EDF Compliance management staff to step in and take control. Commercial systems exist – like EMSOL – to provide a complete monitoring package which will save EDF money in the long term. All schools likely to be affected by air borne pollution should be covered by monitoring devices. Monitoring systems should provide instant feedback so that action can be taken as soon as targets are surpassed – not those cheap tubes which take several months to collect pollution, and a laboratory to analyse them.

Vehicle standards – Euro6 emission standards are the current 'best practice'. EDF could promise to ensure that all delivery lorries would be mainly Euro6 standard, and ensure that a programme of maintenance (and filter cleaning) is adhered to. London has a Low Emissions Zone (LEZ) to monitor vehicle standards in the centre (and suburbs) of the city. EDF could similarly have a scheme which monitors traffic, ensuring that only low emission vehicles enter their working zone, and surrounding rural villages. Vehicle drivers should be expected to turn off ignitions whenever stationary

Road cleaning – local authority road cleaning vehicles are rarely seen in Suffolk – washing and 'hoovering' road dust from its surface and gutters – but EDF could employ several such vehicles on a rolling programme of road cleaning and dust extraction.

A Hospital or clinic – specialising in Respiratory illnesses, based close to Leiston. People already suffering from respiratory problems – eg. Asthma and COPD – could be given compensation for the increase in symptoms they are likely to experience. For example - **Cheaper Electricity** – for East Suffolk residents in acknowledgement of the health risks they are likely to suffer.

Schools and Parents – these need to be informed of the nature of the problem and advised of any steps they can take to mitigate the problem posed by the pollution which has effects lowering intelligence and cognitive ability. Pregnant mothers need to be advised at their GP / clinics.
EDF should install air filters / air conditioning in schools and clinics. An app or telephone service should be able to warn schools and mothers when the wind direction is unfavourable, and they should close windows and stay indoors. Personal Protection masks should be supplied to all of these. Mothers and fathers working at the site should be warned of this problem, and should be provided with appropriate PPE for use at work and the journey home.
Ofsted [statutory body assessing schools] should be consulted and arrangements for assessment / inspections adjusted for an expectation of lower standards than previous, or elsewhere.

Site Machinery -
All non-road mobile machinery and infrastructure/management should be NRMM compliant. Legislation such as NRMM – Non road mobile machinery – has been introduced 2019/2020 to monitor the emissions of such machinery which does not get taken into account by traffic projections on construction sites. (diggers/excavators/dumper trucks, and including diesel generators are responsible for up to 25% on site emissions - https://www.theguardian.com/sustainable-business/2017/apr/20/air-pollution-construction-industry-cities-diesel-emissions-london – *according to the London Atmospheric Emissions Inventory, construction sites are responsible for approximately 7.5% of damaging nitrogen oxide (NOx) emissions, 8% of large particle emissions (PM10) and 14.5% of emissions of the most dangerous fine particles (PM2.5).*)
It should be necessary to purchase/use new emission-compliant plant, and not allow legacy vehicles or generators on site.
'Off grid Energy' have developed products which turn traditional *generators* (responsible for 25% of site emissions) into hybrid machines reducing fuel consumption and emissions – this should be considered.

Logistics -
EDF plan to use a logistics system to manage traffic flow from their holding area near Ipswich to ensure smooth flow of timely deliveries, and this is to be commended. However the logistics should be extended to a system – EMSOL (https://emsol.io/) is one example – of a digital

monitoring/feedback solution which constantly monitors air quality, noise, onboard tracking/telematics of vehicles and other data feeds. This will save them money and help minimise fine pollution. EDF should also monitor traffic leaving the site, returning home, to ensure they keep to approved routes.

Training -
Staff should be trained not only in construction techniques but also in

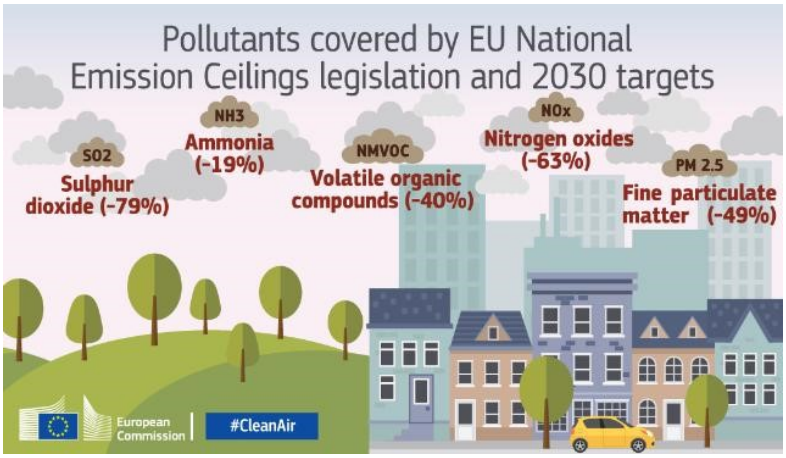
- the importance of minimising PM2.5 pollution effects, on their own health (230 construction workers die annually from cancers caused by diesel fumes – Health and Safety Executive, rr800pdf) and of the health of people in Suffolk.
- Techniques to minimise emissions – maintaining plant and reporting inefficient plant, switching off when not in use,
- Supply chains should also be involved in training, and recognising their role in producing these emissions and minimising them.
- Construction workers should be encouraged or even rewarded, to minimise miles driven, maintain their vehicles, choose Euro5/6 compliant vehicles, and share with others where possible.

Local supply chains -
reduce the road/ sea/ rail miles associated with sourcing materials.

8. Relevant legislation covering the emission of fine particles

EU legislation - https://ec.europa.eu/environment/air/reduction/index.htm

From 2011 to 2013 the Commission conducted a review of the EU air policy which resulted in the adoption of the Clean Air Policy Package. As part of the package, the Commission proposed a Clean Air Programme for Europe, updating the 2005 Thematic Strategy on Air Pollution, in order to set new objectives for EU air policy for 2020 and 2030.
The main legislative instrument to achieve the 2030 objectives of the Clean Air Programme for Europe is Directive 2016/2284 on the reduction of national emissions of certain atmospheric pollutants which entered into force on 31 December 2016. This Directive sets national reduction commitments for the five pollutants (sulphur dioxide, nitrogen oxides, volatile organic compounds, ammonia and **fine particulate matter**) *responsible for acidification, eutrophication and ground-level ozone pollution, which lead to significant negative impacts on human health and the environment.* [my emphasis]



During the construction of this project, this directive will come into force

From – Brexit and Air Quality – House of Commons Library BRIEFING PAPER Number CBP8195, 21 May 2019 p30 – "no change"
5. Air quality and Brexit issues Until a final Brexit agreement is reached with the EU, much of what will happen to air quality standards and enforcement following Brexit is the subject of speculation. The Government has been clear that it has no plans to change limit values and targets for air quality following Brexit. In relation to air quality, the Government has said that the "European Union (Withdrawal) Bill [now Act] is designed to ensure that, as far as possible, the same rules and laws will apply on the day after we leave as on the day before."

and page 31 -
Answered by: Dr Thérèse Coffey 08 March 2017 w
The Ambient Air Quality Directive (including its limit values and target values) was transposed into law in England through the Air Quality Standards Regulations 2010. There are no plans to change the limit values and target values in the Regulations.

The Government's 25 Year Environment Plan, published in January 2018 stated:
The UK's determination to improve air quality is reinforced by our commitment to meeting ambitious, legally-binding targets to cut emissions of five pollutants – ammonia, nitrogen oxides, non- methane volatile organic compounds, fine particulate matter and sulphur dioxide – by 2020 initially, and by 2030 for a deeper cut. Our commitment to meeting these legally binding targets is not affected by the UK's departure from the EU.

UK: from https://www.gov.uk/government/statistics/air-quality-statistics/concentrations-of-particulate-matter-pm10-and-pm25
The Air Quality Standards Regulations 2010 require that concentrations of PM in the UK must not exceed:

- An annual average of 40 µg/m3 for PM10;
- A 24-hour average of 50 µg/m3 more than 35 times in a single year for PM10;
- An annual average of 25 µg/m3 for PM2.5. (to be achieved by 2020)

Table 1.2: National exposure reduction targets for $PM_{2.5}$.

Exposure reduction target relative to the AEI (average exposure indicator)[1] in 2010[2]		Year by which the exposure reduction target shouldbe met
Initial concentration, µg m^{-3}	**Reduction target, %**	
less than or equal to 8.5	0	2020
more than 8.5 but less than 13	10	
13 to less than 18	15	
18 to less than 22	20	
22 or more	All appropriate measures to achieve 18 µg m^{-3}	

1 The AEI is derived from three-year average urban background measurements (i.e. 2009, 2010, 2011 for 2010) as defined in the EU Ambient Air Quality Directive (2008/50/EC).
2 Where the AEI in the reference year is 8.5 µg m^{-3} or less, the exposure reduction target is zero. The reduction target is also zero in cases where the AEI reaches the level of 8.5 µg m^{-3} at any point of time during the period 2010 to 2020 and is maintained at or below that level.

2020 has now gone and the PM2.5 target is 20 µg/m3

('Legal') Precedents -

1. in the inquest into the death of Ella Kissi-Debrah, where it was found that levels of air pollution contributed to this young girls death – December 2020. [Dec 16th 2020 – 'air pollution as a contributory factor to her death', written on death certificate, due to NO2 and Particulates].
Prof Stephen Holgate, a respiratory disease expert, drew a direct causal link to the levels of air pollution and her condition worsening to require admission to hospital.
"I am suggesting that a biological cause of her disease was that during those winter months where air pollution was getting worse in her area, as occurred in the smogs of the 50s, this was when she would be experiencing her worst exposures."

2. Suffolk planning application for 27 self build homes – Melton. Dec 2020

The planning officer said the developers had "not provided sufficient information to demonstrate that a suitable drainage scheme can be achieved, nor that the occupiers of the proposed dwellings would have adequate living conditions due to potential adverse impacts from noise and poor air quality". (my underline)

3. Suffolk CC – AQMA – air quality management area

Since 2011 air quality has been recognised as a problem, and so Suffolk set up 3 AQMA to monitor the problem – (I have edited this report published by SCC)

Stratford St Andrew AQMA

Concern about the air quality in this area of the A12 led to us monitor levels of nitrogen dioxide (arising from vehicle exhausts) in Farnham, Little Glemham and Stratford St Andrew since 2011. During 2011-2013, the level of nitrogen dioxide (NO2) at Long Row in Main Road, Stratford St Andrew consistently exceeded the Air Quality Objective of 40 µg/m3. Levels at all other locations were within the Objective. Detailed Assessment

investigations into this exceedance were completed in 2013 and recommended declaration of an Air Quality Management Area (AQMA) for the 4 properties at Long Row, Main Road, Stratford St Andrew. The AQMA was declared in June 2014. Action Plan

The Steering Group set up for this AQMA produced a draft Air Quality Action Plan which received approval from Defra in February 2017 with a few suggested changes. Public Consultation on the draft Action Plan was undertaken in August 2017 ……The final Action Plan included a number of suggested changes by Defra, and in March 2018 received final Defra approval.Current Progress

NO2 concentrations fell below the objective for the first time in 2017 (39 µg/m3) and again in 2018 (38 µg/m3), the first year of monitoring following the move of the 30mph speed limit.

Woodbridge Junction AQMA

Detailed Assessment into concentrations of nitrogen dioxide (NO2) arising from vehicle exhaust emissions at the junction of Lime Kiln Quay Road, The Thoroughfare, St. John's Street and Melton Hill in Woodbridge (Woodbridge Junction) were completed in 2005 and concluded that an AQMA should be declared at the junction. The Air Quality Management Area was declared in 2006 and covers 6 properties on the western side of the Thoroughfare/Melton Hill arm of the junction.

A Further Assessment was undertaken for the junction in 2007, confirming that the AQMA should be retained. This assessment concluded that approximately 90% of the NO2 emissions are as a result of local traffic, both stationary and moving vehicles. It also advised that approximately 50% of the emissions are from Light Duty Vehicles (cars and vans) and 50% from Heavy Duty Vehicles (larger lorries).

Councils are required to produce an Action Plan following declaration of an AQMA. The overall aim of the Action Plan is to provide a framework for identifying and implementing measures to reduce emissions and mitigate the effects of air pollution. Following public consultation in 2010 the

Action Plan for the Woodbridge AQMA was finalised and received approval from Defra in May 2011. The Action Plan currently consists of 20 measures that could be undertaken at the junction to hopefully ease the congestion / reduce the overall traffic flows, and therefore in turn reduce the elevated levels of nitrogen dioxide being experienced.

The MOVA system has not been successful in reducing NO2 levels within the AQMA to below the Objective.

A feasibility study was completed for the 5 measures remaining which involve 'physical junction alterations'. This shows 1 measure to have a negative impact and the remaining 4 to have a negligible impact on NO2 concentrations in the AQMA. It is therefore unlikely that any of them will be implemented. The feasibility study has 2 recommendations; to install a weather station for 3 months within the AQMA, and to trial holding back traffic a distance from the lights (therefore away from the AQMA) and pulse it through.

The weather station was installed from July to November 2015 and results showed that the topography of the junction itself is a major factor in the elevated levels seen. The layout of the junction is such that the wind speed is much lower than expected and the wind direction is slightly altered from the norm. The study suggests that vehicle emissions are being 'funnelled' along Melton Hill away from the junction, and are then dispersed very slowly due to the low wind speeds and canyon like effect of the buildings on both sides. Emissions therefore tend to accumulate rather than disperse resulting in higher than expected NO2 concentrations at this road junction. Interestingly, NO2 concentrations within the AQMA have reduced to

below the Objective level in 2014, 2015 and 2016 but there have been no alterations in traffic flows or make-up and no additional schemes undertaken which would explain this reduction. One hypothesis is that 2014, 2015 and 2016 may have been generally more wet and windy years which has acted to increase the dispersion of NO2 away from the properties at the junction thus reducing the recorded concentrations. Another hypothesis could be that general fleet emission reductions are starting to be realised as older vehicles are replaced with newer cleaner ones.

***Ferry Lane Felixstowe AQMA** - Revoked*

An AQMA was declared in 2009 due to exceedances of the air quality objective for annual mean nitrogen dioxide (NO2) at the Dooley Inn public house, Ferry Lane, Felixstowe. A Further Assessment was completed in 2010 confirming that the AQMA should be retained, and concluding that container handling activities on the Port, and heavy duty vehicles on roads external to the Port made the greatest contribution to NO2 levels within the AQMA. Following public consultation in 2012 the Action Plan for the Ferry Lane Felixstowe AQMA was finalised and received approval from Defra in 2012.

The Action Plan consists of 13 measures to try and reduce nitrogen dioxide levels in the area, of which seven have now been completed. Six measures are the responsibility of the District Council (three of these have been completed) and seven are the responsibility of the Port of Felixstowe (four of these have been completed). All other measures which are the responsibility of the Port of Felixstowe have been started and are on-going.

Since the declaration in 2009, measured annual mean concentrations have declined in the AQMA - the results of diffusion tube monitoring undertaken in 2016 confirmed that annual mean nitrogen dioxide concentrations within the Felixstowe AQMA boundary continue to reduce and are below the Air Quality Objective for the fifth year running at 34µg/m3. Despite an increase in throughput in the port, the implementation of these measures has assisted to reduce NO2 concentrations. Furthermore, a similar decline in measured levels are occurring at other locations around the port.

A Detailed Assessment has been undertaken which concludes that the annual mean Air Quality Objective for NO2 is now met within the Felixstowe AQMA and that there are unlikely to be any exceedances in the future. As a result it is recommended that the Felixstowe AQMA at the Dooley Inn, Ferry Lane should be revoked. The findings of this assessment received approval from Defra earlier this year were taken to the Council's Cabinet meeting on 5 April 2016 where they also received approval.

Public Consultation results - Revocation of the AQMA at Ferry Lane, Felixstowe - May/June 2016

During May and June 2016 we undertook a Public Consultation asking for views and comments on our intention to revoke the AQMA declared at Ferry Lane, Felixstowe. The Consultation ran for 6 weeks and ended on 30 June 2016.

Ferry Lane Felixstowe AQMA Revocation Order

On 5 October 2016 the AQMA declared at Ferry Lane, Felixstowe was revoked following the results of a Detailed Assessment. Our air quality duties do not end now that the AQMA has been revoked:

- *Monitoring for nitrogen dioxide will continue within the AQMA, at locations around the Port of Felixstowe, and along the A14 trunk road at Trimley and Felixstowe.*
- *Yearly reports containing the monitoring data will continue to be published on the council's website and*
- *Air quality will continue to be considered in planning policy and future planning permissions across the district, and more specifically those which could impact on this area in Felixstowe.*

BBC news online 26th aug 20

Two councils have been accused of failing to properly address dangerous levels of air pollution in Ipswich. Campaign group Ipswich CAN said Ipswich Borough Council and Suffolk County Council needed to do more to lower emissions in the county town.

Tony Horner, who founded the group, said air pollution caused "horrendous ill health". Suffolk County Council said it and other authorities were taking "issues of air quality very seriously".
There are 11 areas of Suffolk where air pollution has been found to be too high, five of which are in Ipswich.

These have been designated as Air Quality Management Areas, meaning councils must put in a plan to reduce pollutants to government-set levels.
According to Public Health England figures from 2018, Ipswich was above the England and East region average for air pollution.

9. Reports and Research into the problems

I refer to research on the increasing knowledge of the dangerous health effects of this pollution, and to reports / legislation that are relevant

a. Air Quality Expert Groups report – Fine Particulate Matter - for Defra 2012

page 12 section 1.3 Effects of PM2.5 and links to climate change
1.3.1 Health effects of PM2.5
-10. The Committee on the Medical Effects of Air Pollutants (COMEAP) reports *LongTerm Exposure to Air Pollution: Effect on Mortality* (COMEAP, 2009) and *The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom* (COMEAP, 2010)
1.3.2 Ecosystem impacts of PM2.5 in the UK
1.3.3 Climate change impacts of PM2.5 in the UK

b. Economic Commission for Europe
Executive Body for the Convention on Long-range Transboundary Air Pollution
2015 – UN Gothenburg protocol

Guidance document on control techniques for emissions of sulphur, nitrogen oxides, volatile organic compounds and particulate matter (including PM10, PM2.5 and black carbon) from stationary sources

c. UNECE - ECONOMIC COMMISSION FOR EUROPE
Guidance Document on Emission control techniques for mobile sources under the Convention on long range Transboundary Air Pollution 2016

d. Defra -
Public Health – Sources and Effects of PM2.5
https://laqm.defra.gov.uk/public-health/pm25.html

e. AQPI Summary report 1990 – 2012
Emissions of Air quality pollutants

f. Public Health England (on costs relating to treatment of air pollution illness)
https://www.gov.uk/government/publications/air-pollution-a-tool-to-estimate-healthcare-costs
A summary of the main findings and policy implications from the model results are as follows:
• In England, the total NHS and social care cost due to PM2.5 in 2017 was estimated to be £41.20 million (based on data where there is more robust evidence for an association), increasing to £76.10 million when diseases are included where the evidence is associative or emerging.

• In England, the total cost to the NHS and social care due to NO2 in 2017 is estimated to be £1.68 million (based on data where there is more robust evidence for an association), increasing to £81.06 million when diseases are included where the evidence is associative or emerging.
• Between 2017 and 2025, the total cost to the NHS and social care of air pollution in England for where there is more robust evidence for an association, is estimated to be £1.60 billion for PM2.5 and NO2 combined (£1.54 billion for PM2.5 and £60.81 million for NO2)

• If we include the NHS and social care costs for other diseases for which there is currently less robust evidence for an association, then the estimate is increased to a total of £2.81 billion for PM2.5 and £2.75 billion for NO2 in England between 2017 and 2025.

g. World Health Organisation
https://www.who.int/health-topics/air-pollution#tab=tab_2

Key facts – Outdoor air pollution

- *Air pollution is a major environmental risk to health. By reducing air pollution levels, countries can reduce the burden of disease from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma.*
- *The lower the levels of air pollution, the better the cardiovascular and respiratory health of the population will be, both long- and short-term.*
- *The WHO Air Quality Guidelines: Global Update 2005 provide an assessment of health effects of air pollution and thresholds for health–harmful pollution levels.*

h. DEFRA
Air quality: National Air Pollution Control Programme 2019 sets standards of reduction in emissions for future
UK subject to EU law – National Emissions Ceilings Directive,
and International law – Gothenburg Protocols
UK Environment Act 1995 – National Air Quality Strategy

The National Air Pollution Control Programme (NAPCP) is a UK wide document. It sets out measures and technical analysis which demonstrate how the legally binding 2020 and 2030 emission reduction commitments (ERCs) for 5 damaging pollutants (nitrogen oxides, ammonia, non-methane volatile organic compounds, particulate matter and sulphur dioxide) can be met across the UK.

May 2018 / Jan 2019 – Defra Clean Air Strategy – halve the population living in areas above the WHO limit of 10ug/km3, by 2015

2017 / 2018 UK Plan for Tackling roadside Nitrogen Dioxide concentrations
Transport – Road to Zero Strategy, p33 projected emissions in KiloTonnes with reduction targets from baseline 2005 to 2030

i. Institute of Air Quality Management – May 2020
A guide to the assessment of air quality impacts on designated nature conservation sites
- the scope and impact of air pollutants especially Sulphur, Ammonium, Nitrogen

10. My recommendations – my analysis of the risk

In my view, the pollution which will be created by the SZC project makes it unacceptable to proceed, in terms of Public Health alone. There is irony in creating many respiratory illness cases when the project is allegedly about creating 'clean' energy. PM2.5, PM1 and NO2/Nox emissions are all associated with medical effects – initially respiratory problems, but also in all known conditions of all organs in the human body. Hospital admissions will rise, and there will be increase in mortality associated with it.

Expensive as it is, the mitigation for PM2.5 / NOx is neither easy nor efficient – there's not a lot of difference it can make as the particles are so small and mobile.

The ecological effect of spreading these harmful pollutants around Suffolk's ecologically sensitive sites – woods, heaths, ponds, estuaries, SSSIs, RSPB – would permanently damage our environment and the eco-tourist economy it has developed. After 10-15 years of pollution, it would be difficult to restore these habitats in future decades.

Pollution of the air is already present in Suffolk, especially along the road routes, though not as extensive as other parts of the country. My baseline air pollution measurements indicate that already, for some of the time, the air quality is 'Moderate', 'High' or even 'Very High' by International standards. An increase in continuous 24hour for a decade of road traffic and construction at the SZC site will ensure that more locations in this area will fall into the 'Very High pollution' assessment, and it will have an impact on the health of most East Suffolk residents.

I remind you that a legal precedent has now been set with the death of Ella Kissi Debrah, where air pollution has been acknowledged as a cause of death. This will open the doors to other families in Suffolk blaming air pollution created by the EDF project, as a cause of death.

In terms of the effect of pollution on the health of people, and its effect on the flora & fauna in East Suffolk, I invoke the **Precautionary principle**. Fine particulate pollution (<PM2.5, PM1, NO2) cannot be mitigated by any realistic mechanical method, although some efforts to minimise it (very slightly) could be taken. The real scale of the health hazard is being ignored, by not being considered in EDF's plans. I challenge EDF to consider the health hazard of fine particulates and show what they plan to do about this.

In terms of air pollution created by the traffic supporting the development of SZC and the heavy plant excavating and operating there, over an extended time period, no reasonable person could ignore this issue and avoid acknowledging the health problems that this will cause for all children and adults (especially those vulnerable), as well as the harm to flora and fauna.
It would be unreasonable for the Inspectorate to not hold EDF to account for this, and for EDF to try to avoid this responsibility. (Wednesbury)

Much of rural East Suffolk does not suffer from excessive air pollution, other than a background of coal/woodburning emissions – winter and evenings -, and agriculture – seasonal.
There are few major trunk roads through the area – A12, A14, A1120 – and already, without any construction projects in the area – some of these are associated with raised pollution values. Occasionally they become 'Very High' as measured on the World Health Organisation scale, therefore becoming a health hazard to humans (and to the rich diversity of flora/fauna found here).
The Sizewell C project will bring far greater volumes of traffic, almost 24hours a day at peak times, plus the non-mobile heavy plant working on site. This inevitable pollution will spread not only on, and from the major road system, but throughout the rural feeder roads.

My Recommendations: if this project goes ahead.

- Comprehensive air quality monitoring points along trunk roads and feeder routes, with public access to data. Monitoring devices should also be at each school in East Suffolk, especially Farlingaye at Woodbridge (along the A12), Yoxford (close to A12), and all Leiston schools.
- Leiston should be in an AQMA -air quality management area – monitored by Suffolk Air Quality Management Group.
- EDF to have a Logistic system to minimise traffic excesses.
- All delivery vehicles to be Euro6 compliant, and roadworthy. Guidance on routing should exist en-route to SZ as well as them returning to their base.
- Delivery vehicles should have defined routes. The EDF plans specify their route into the site is defined, but they have not specified their return routes.
- Commuting 'workers' should be encouraged to share vehicles, have Euro5 or Euro6 compliance, be properly maintained and be mandated to follow speed limits.
- Action on failing to meet AQ targets for emission ceilings should be agreed in advance with Suffolk Air Quality Management Group, specifying roads, towns/villages and routes, and the scale of cessation of activity and time period.

11. Background / baseline levels, and my own data measurements

East Suffolk has two permanent analysers in the AQMA and a network of at least 16 diffusion tubes to monitor air quality. The nearest to SZC is in Leiston.

> The convenience of **diffusion tubes** comes with two main disadvantages. The main disadvantage is **accuracy** (the results are considered to be +/- 20% **accurate**), and of course we only get one number representing a whole month, meaning it is not possible to examine daily or weekly fluctuations.
>
> www.cheshireeast.gov.uk › environment › local_air_quality
>
> Diffusion Tube Monitoring - Cheshire East

Diffusion tubes are passive, relying on the pollution to attach itself to a disc which is sent away to a laboratory after 3 months exposure. They are +/-20% accurate!

I bought a modern laser analyser – it is accurate to within 1 or 2% and gives immediate results measuring PM10, PM2.5,PM1.0 and NO2.

I wanted to check my own baseline measurements of fine particulate pollution in this region and bought a new Plume Flow2 analyser.
It continuously records – at 1 minute intervals – measurements of

- PM2.5
- PM10
- PM1
- NO2
- VOC

It measures values of AQI (Air Quality Index) – but can export data with actual ugm/m3 levels

PLUME - Here's some more detail. Air Quality Indexes are a scale, not a unit of measurement. We take the raw concentrations and pass them through an algorithm to produce an index giving an indication of how current pollution levels are impacting your health. This is also true of other AQIs commonly used around the world. Physical units (such as parts per billion or micrograms per cubic meter of air) are not very useful to display, because the harmfulness of pollutant varies from pollutant to pollutant. 20ug/m3 of particulate matter has a different impact on your health than 20ug/m3 of NO2, for example. So if you saw the same value in these two pollutants, you wouldn't be able to draw any comparisons or conclusions between them.

At Plume Labs, we wanted to make air quality data accessible, enlightening, and empowering. The Plume AQI makes pollution data easier to share, compare, and most of all to understand when it comes to our health. To get started, our data experts and atmospheric scientist created the Plume AQI. The Plume AQI is directly related to personal health. It's in line with international health recommendations and allows you to compare air quality data across the entire globe—a reading of 45 on the Plume AQI in New York is the same in Beijing and the same in London.

The Plume AQI takes into account the main pollutants that are harmful to human health: including particulate matter (PM2.5 and PM10), nitrogen dioxide (NO2) and volatile organic compounds (VOC). We base our recommendations on

the World Health Organisation's annual, daily, and hourly exposure guidelines, along with other global institutions, including the European Commission, the Chinese Air Quality Standards, and the United States EPA.

Each of the categories of the Plume AQI indicates something specific about the length of time one can be exposed to such pollutant rates without an adverse impact on health, so it ensures that citizens get actionable information to take real steps towards improving their environmental wellbeing.

I hope that is a clearer explanation of why we don't specify a unit of measurement. The sensors do record a reading in micrograms per cubic meter (ug/m3), but we do not display this value as it is difficult to interpret and not useful for the user to know.

Pollution Thresholds

We base our recommendations on the WHO annual, daily, and hourly exposure guidelines, along with other global institutions, including the European Commission, the Chinese Air Quality Standards, and the United States EPA.

Each of the categories of the Plume AQI indicates something specific about the length of time that you can be exposed to such pollutant rates without an adverse impact on your health, so it ensures that you can get actionable information to take real steps towards improving your wellbeing.

0-20 Low Pollution

The air is clear—perfect for outdoor activities! Pollution levels are under the recommended exposure thresholds set by the World Health Organisation (WHO) for one year of pollution exposure. Nothing to worry about if your lights are green!

21-50 Moderate Pollution

Air quality is considered acceptable, though over the recommended WHO threshold for one year. This means that, unless you have these kinds of conditions all year round, you shouldn't be experiencing adverse health effects. However, there may be certain health concerns for people with specific sensitivities. Always consult your physician!

51-100 High Pollution

The air is highly polluted—above twenty-four-hour exposure recommendations from the World Health Organisation. Everyone may start to feel adverse health effects, and those with sensitivities should take care when performing outdoor activities.

101+ Very High Pollution and above

Everyone may start to experience more serious health effects at these levels, and long term exposure constitutes a real health risk. Levels have exceeded the recommended WHO exposure threshold for one hour.

In certain regions, or during exceptional pollution peaks, you may experience higher levels of pollution over 200 or even 300. These warnings constitute emergency conditions. There can be harmful impacts on the general public, even in the case of short-term exposure. All individuals should avoid physical activities until pollution subsides, regardless of sensitivities.

By comparison:

AQI's – UK – have a 4 point chart which describes :

- Low - value 1 to 3
- moderate - value 4 to 6
- high - value 7 to 9
- very high - value 10

and describes symptoms people at risk might experience

AQI's – USA – have a 6 stage scale of 0-500points describing :

- Good – 0-50
- Moderate – 51-100
- Unhealthy for sensitive groups – 101-150
- Unhealthy – 151 – 200
- very unhealthy – 201-300
- Hazardous – 301 – 500

NB a value of 100, generally corresponds to an ambient air concentration equalling the level of short term national air quality standards for the protection of Public Health.
AQI's are an internationally recognise standard

Example: using a Plume for a week in December 2020, mostly indoors – average 24 levels

Date	Level	AQI
7th Dec	M	20
6th	M	34
5th	H	51
4th	H	71
3rd	H	79
2nd	H	71
1st	H	74

So the 'baseline' for my house and my area are already moderate to high!

C	D	E	F	G	H	I	J	K	L
NO2 (ppb)	VOC (ppb)	pm 10 (ug/m3)	pm 2.5 (ug/m3)	NO2 (Plume AQI)	VOC (Plume AQI)	pm 10 (Plume AQI)	pm 2.5 (Plume AQI)	pm 1 (ug/m3)	pm 1 (Plume AQI)
12.6	176.4	30.4	23.1	13.0	13.9	30.4	45.6	3.8	9.6
			avg						
193.0	1273.0	392.6	78.4	141.0	71.0	295.0	128.0	55.0	125.0
			max						

Exporting detailed data, which shows actual levels of ugm/m3 for the first 9 days of December -

PM2.5 – avg level of 23.1 (moderate), and max level of 78.4 (high)
PM1 – (smallest measurable, penetrating brain – no safe standard) avg level of 3.8 (very low) and max level of 55 (high)
NO2 – avg level of 13 and max level of 141 (very high)

If these are baseline measurements for the interior of a Suffolk house, 10 miles from SZC but adjacent to the A1120, how can the baseline measurements from EDF be so low.

<u>Baseline measurements around East Suffolk within reach of SZC pollutions</u>
Baseline measurements have been done by me in locations where people live and move and travel through – not remote fields. Recorded Dec 12th-15th 2020.
They represent moments in time, but I have collected 20 minutes of data points in each.
They represent a norm for a time before construction.
Some represent values which are already too high for good human health

		NO2 (ppb)	VOC (ppb)	pm 10 (ug/m3)	pm 2.5 (ug/m3)	NO2 (Plume AQI)	VOC (Plume AQI)	pm 10 (Plume AQI)	pm 2.5 (Plume AQI)	pm 1 (ug/m3)	pm 1 (Plume AQI)	
	avg											
Darsham		2.9	60.9	61.3	18.9	3	4.9	55.3	35.2	13.7	34.1	AQI
westleton pond		0	121.7	4.6	2	0	9.7	4.6	4	1	3	Moderate
dunwich beach		0	55.6	65.3	8.7	0	4.5	64.6	15.5	2	5.3	
dunwichheath		0	59.1	12.3	2	0	4.6	12.8	4	1	3	High
sz		22.3	38	19.1	2.4	23	3.1	19.3	4.9	1.1	3.1	
road		29.5	110.3	7.8	2	31.7	8.8	7.8	4	1	3	V.High
farnham		29.4	55.3	5.4	2.2	32.6	4.3	5.4	4.3	1.2	3.4	
wickham mkt		16.7	108.9	4.5	2	15.6	8.7	4.5	4	1	3	
ststandrew		9.4	113.9	15.9	2.7	8.9	9.1	17	5.4	1.1	3.1	
yoxford		11.4	105.9	3.1	2	10.8	8.4	3.1	4	1	3	
Peasen		41	36.6	59.9	4.9	46.9	3.2	65.3	9.8	1.1	3.1	WHO >10ugm/m3
Wangford		10.4	48.4	42.4	3	9.7	3.9	42.9	5.7	1	3	
Kenton		16.3	33.1	11.7	2.4	16.3	2.7	11.5	4.3	1	3	
LeisRlwyYd		0	36.3	17.6	2.3	0	3	14.1	3.5	1	3	
LeisCoop		28.5	24	27	2.8	31.3	1.9	21.7	4.3	1	3	
Szroad		23.4	30.3	19.8	2.4	25.3	2.6	16.4	3.9	1	3	
Theberton		11.4	28.9	18.3	2.4	10.8	2.3	14.9	3.7	1	3	
Yoxroundabt		10.9	23.2	21.2	2.7	10.2	1.7	17	3.9	1	3	
MinsmereF		0.3	40.2	36	3.4	0.3	3.3	30.5	5.2	1.1	3.3	
MinsmereReserv		4.1	33.6	44.1	3.5	3.9	2.6	37	5.2	1	3	

average data points above, **maximum** data points below

	NO2 (ppb)	VOC (ppb)	pm 10 (ug/m3)	pm 2.5 (ug/m3)	NO2 (Plume AQI)	VOC (Plume AQI)	pm 10 (Plume AQI)	pm 2.5 (Plume AQI)	pm 1 (ug/m3)	pm 1 (Plume AQI)	
MAXimum											
0	83	47.9	46.9	0	7	48	94	44	110		
0	160	16.6	2	0	13	17	4	1	3		
0	71	131.4	22.7	0	6	132	45	12	29	AQI	
0	93	59.6	3.5	0	7	66	7	1	3	Moderate	
34	65	56	7.2	37	5	60	14	2	5		
40	146	47.4	2.2	47	12	47	4	1	3	High	
43	104	28.8	6.2	50	8	29	12	5	13		
21	169	23.9	2	19	14	24	4	1	3	V.High	
13	209	90.8	11	12	17	107	22	2	4		
15	376	5.8	2	15	29	6	4	1	3		
50	69	152.5	14.5	56	6	145	29	3	6		
20	136	93.6	5.7	18	11	108	11	1	3		
36	52	99.6	7.3	40	4	112	15	1	3	WHO >10ugm/m3	
0	56	75.7	7.5	0	4	93	15	1	3		
57	47	71.6	5.4	61	4	86	11	1	3		
34	57	65.1	6.1	38	5	75	12	1	3		
22	51	63.4	4.8	21	4	72	10	1	3		
19	50	82.6	6.3	18	4	102	13	1	3		
5	110	115.9	9.1	4	9	122	18	4	11		
18	131	75.7	5.9	17	10	93	12	1	3		

Notes on locations:

Darsham – layby opp Jet Petrol stn	Yoxford– on High St. Near to A12 junctn.	MinsmereF – forest walk
Westleton – opposite pond	Peasen – my garden – 30m frm A1120	MinsmereReserv – walk to coastal path
Dunwich beach – along beach and shingle	Wangford – in vets car park	
Dunwich Heath – walk about	Kenton – in car park	
SZ – walk along beach/bank opp SZA,B	LeisRlwy – entrance to rlwy yard	
Road – inside car on A12 journey	LeisCoop – Coop car park	
Farnham – Riverside car park	SZ Road – road leading to SZ, nr pylons	
Wickham mkt – road into town	Theberton – outside Lion PH	
St StA – layby on 12 south of village	Yox roundabt – layby A12 N of Satis Hse	

General notes

- higher figures for NO2 around all main roads – A12 – already dangerous whether as pedestrian or a driver/passenger. There is already Moderate NO2 pollution in 3 places
- PM10 figures high by the A12 with several High pollution figures, and two worryingly Very High data points.
- PM2.5 – moderate average figures with some more Moderate or High maximum data points
- worryingly high PM1 figure – Darsham on A12. No safe limit for PM1s – 34 worrying (110 max is one off)

Observation :

Much of rural East Suffolk does not suffer from excessive air pollution, other than a background of coal/woodburning emissions – winter and evenings -, and agriculture – seasonal.
There are few major trunk roads through the area – A12, A14, A1120 – and already, without any construction projects in the area – some of these are associated with raised pollution values. Occasionally they become 'Very High' as measured on the World Health Organisation scale, therefore becoming a health hazard to humans (and to the rich diversity of flora/fauna found here).
The Sizewell C project will bring far greater volumes of traffic, almost 24hours a day at peak times, plus the non-mobile heavy plant working on site. This inevitable pollution will spread not only on, and from the major road system, but throughout the rural feeder roads.

Notes on Plume / Flow assessment levels
The AQI (air quality index) values are based on WHO guidelines
EU NOx maximum of 40ugm/m3
UK nominal max 25Ugm/m3 PM2.5
WHO limit for PM2.5 – 10ugm/m3

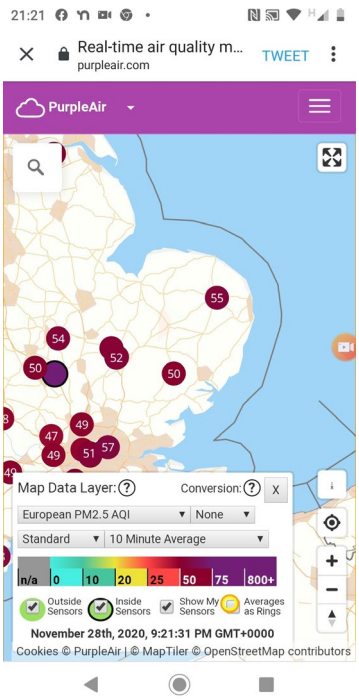
They are internationally valid.

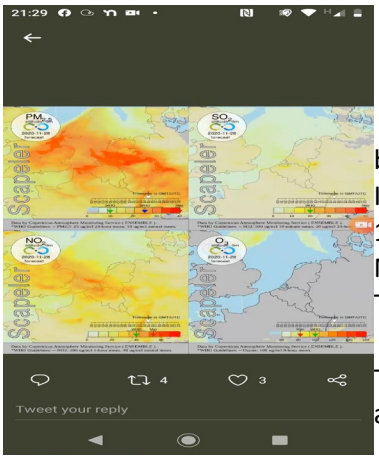
LOW – 0-20 AQI
MODERATE – 21-50 AQI
HIGH – 51-100 AQI
VERY HIGH - 101+

Other air quality readings-

I went online for some air quality analyses
on a random day/time (all the same point in time)

Purple air make air quality sensors and compile maps of pollution levels based on sensors currently recording.
This shows two sensors in the Eastern region measuring PM2.5s at levels of 50 and 55ugm/m3 (slightly worse than most of the others seen) which are well above acceptable levels





This is the result from the Copernicus /ENSEMBLE monitoring service, based in Holland.
It indicates a PM2.5 levels of around 30 , and above the WHO maximums – 10 – and Defra -25 - .
Note also the high levels for NO2 – again above WHO levels.
These are daily average/mean levels

The European monitoring covers a wide area so lacks immediate local anomalies

Air pollution is a European problem, and worryingly high levels are a result of our present lifestyle.
The Sizewell development will make an existing problem far worse for Suffolk residents.