



Air Quality and Health Impact of Waste to Energy and Biomass Combustion

Reaching a conclusion without sitting on the fence

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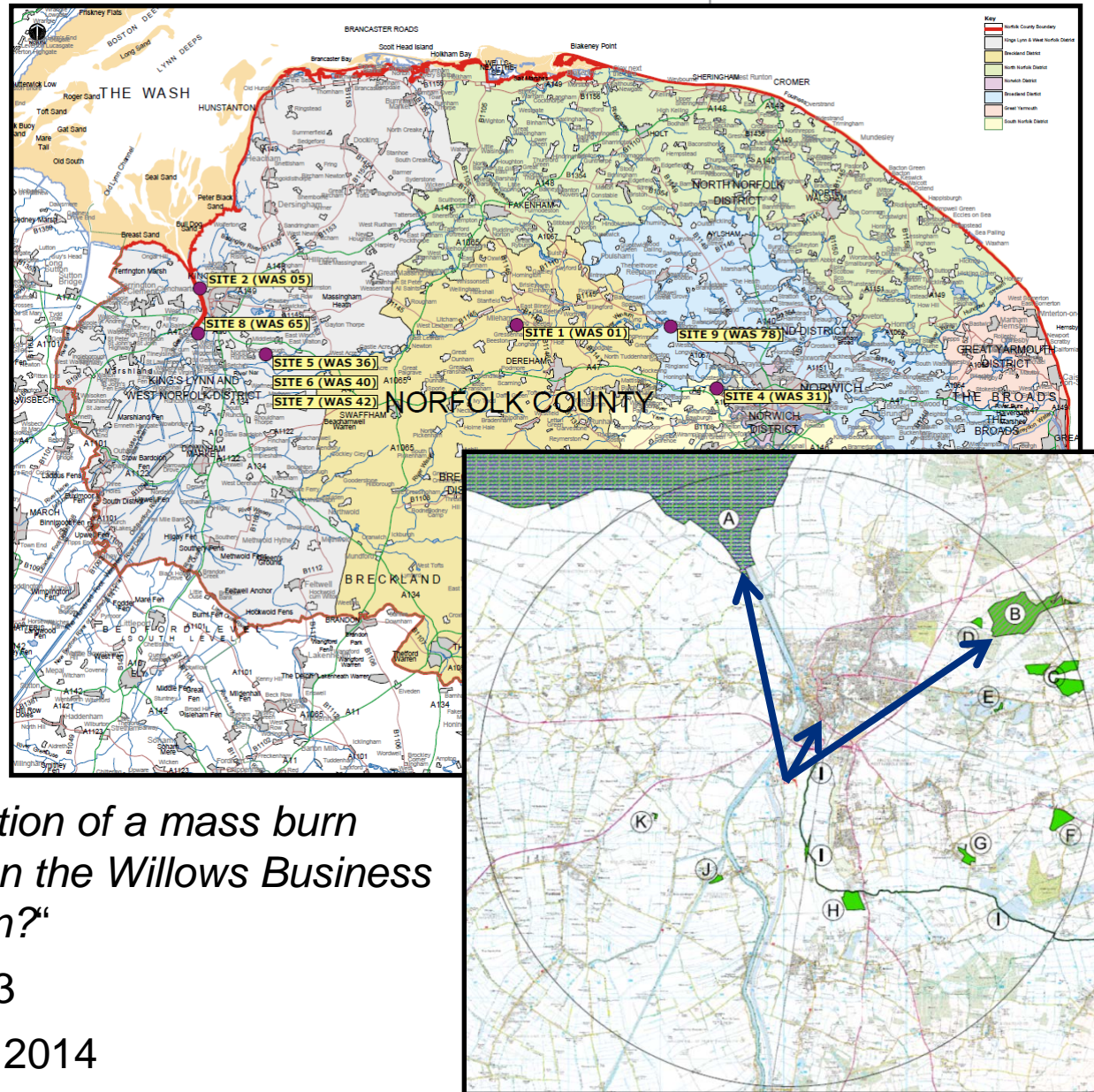
Welsh Air Quality Forum
Fforwm Ansawdd Awyr Cymru

Media Resource Centre,
Llandrindod Wells
25 September 2014

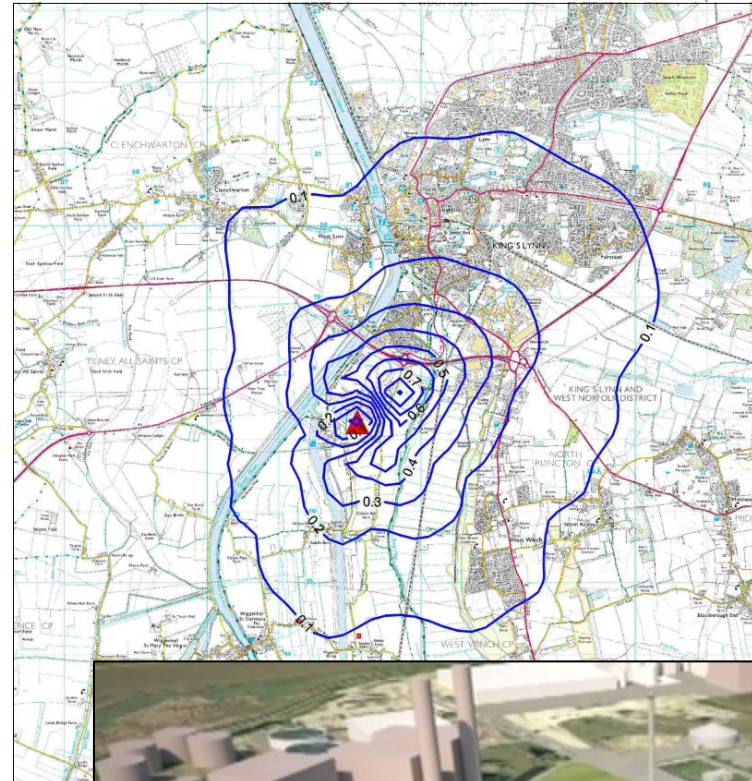
- Recent public debates
 - Willows Power & Recycling Centre, King's Lynn Public inquiry
 - South London Energy Recovery Facility, Sutton Development Control committee
 - Small-scale biomass at new schools in North Lanarkshire
 - Also contributed to procurement and scrutiny processes in Flintshire and Project Green (Caerphilly, Cardiff, Monmouth, Newport, Vale of Glamorgan)
- Air quality, health and nature conservation
- What were the issues for the public and decision-makers?
- What are the key health and air quality issues?
- All views are my own



- Scale: 270,000 tonnes per year
- Located in King's Lynn, north-west Norfolk
 - Some distance from waste arisings
 - “Downwind” of population centre of King's Lynn
 - 6 km from two European habitat sites
- Local referendum found 92% opposed to proposed development
 - *“Do you support the construction of a mass burn municipal waste incinerator on the Willows Business Park, Saddlebow, King's Lynn?”*
- Public inquiry March – May 2013
- Waste contract terminated April 2014

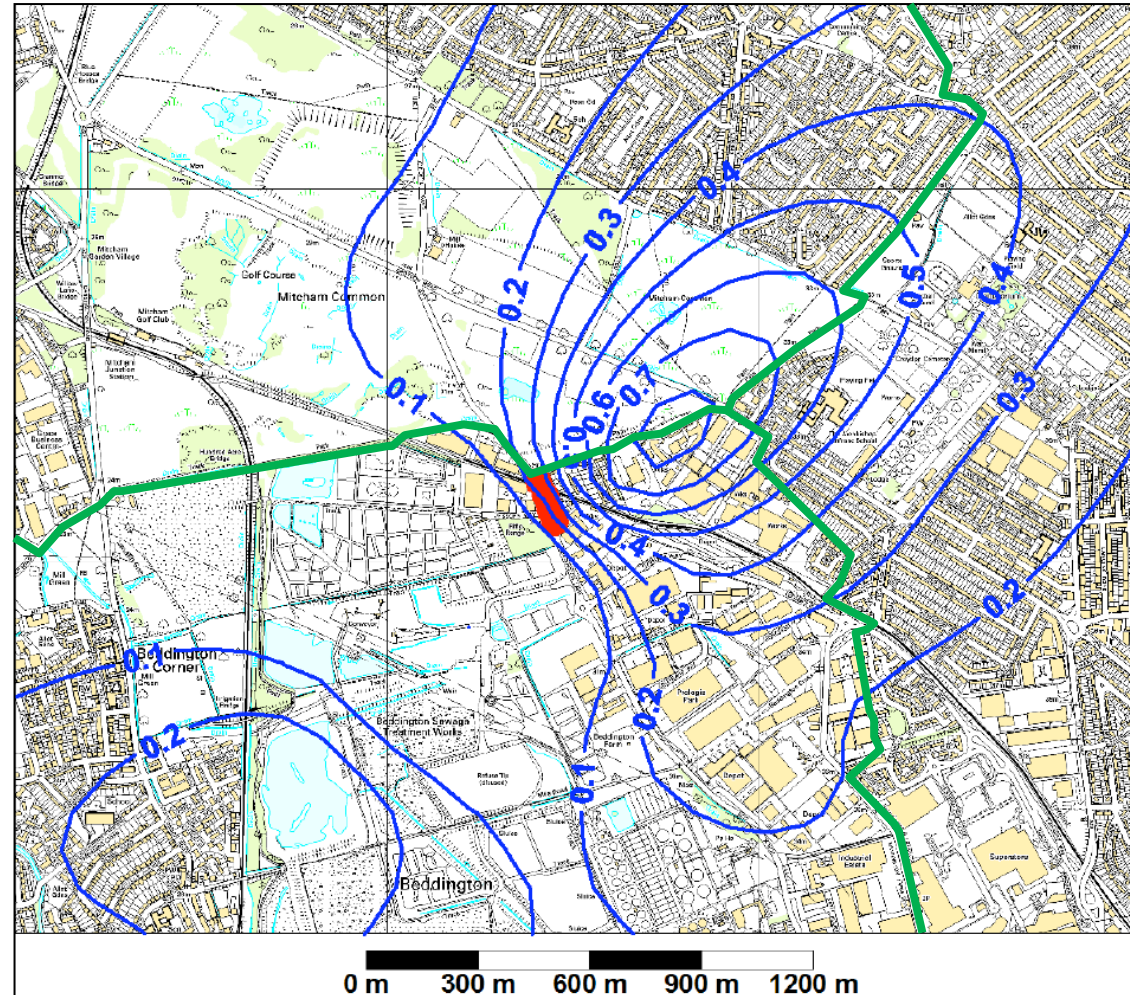


- Ricardo-AEA advisors to Norfolk CC as planning authority on AQ, nature conservation and health
 - No significant air quality impacts
 - No significant risks to health
 - No significant impacts on nature conservation
- Detailed audit of application
- Appropriate assessment
 - Detailed analysis
 - 1% threshold
 - *“the annual process contribution made by the plant will be eliminated by the reduction in nitrogen deposition which has taken place during the course of the inquiry”*

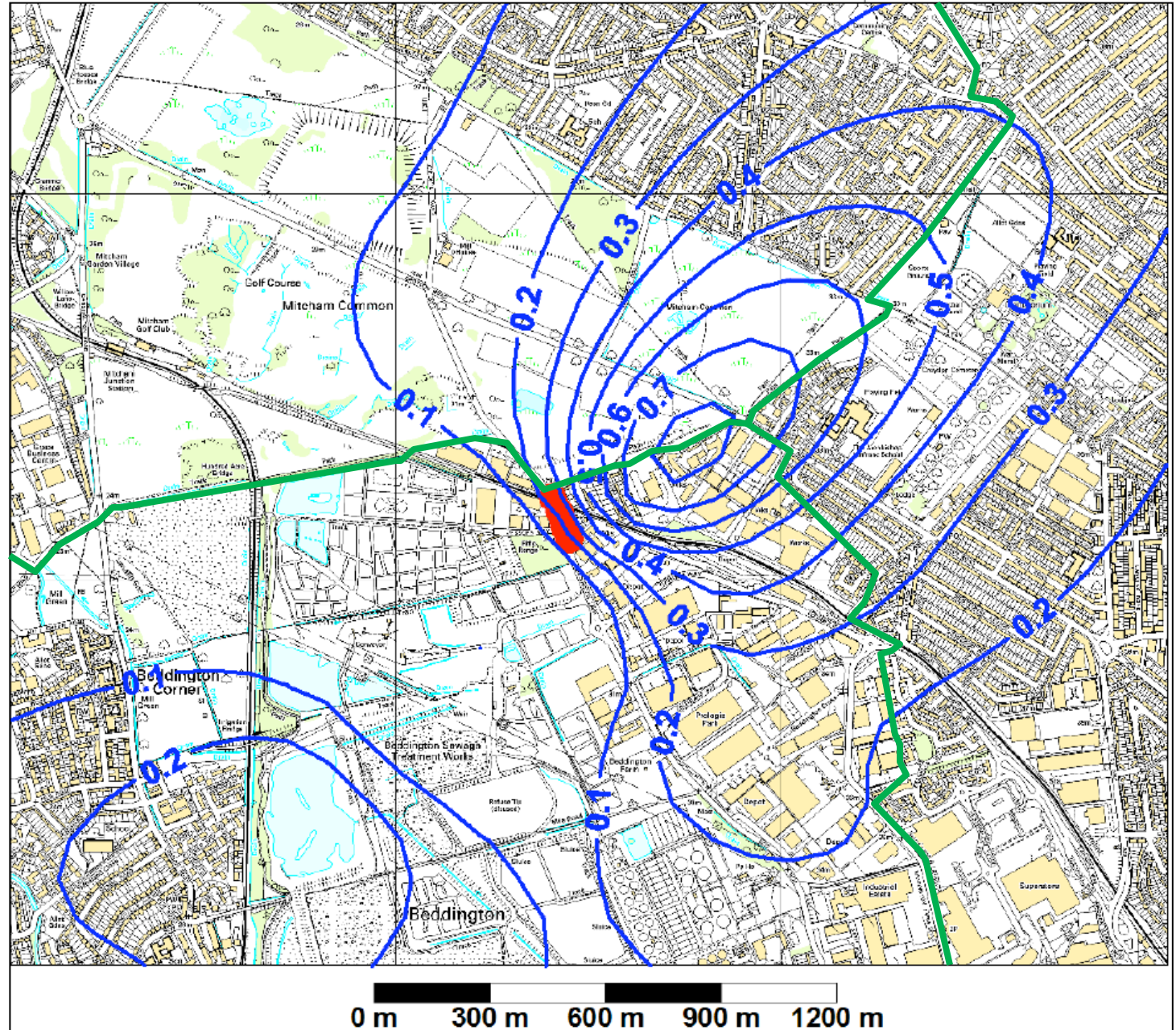


- Genuinely-held concerns – but not relevant for the planning process
 - Scale of proposed facility: impact on recycling/waste hierarchy
 - Location on western edge of county
 - Technology choice
 - Health risks
 - What if things go wrong? Lack of confidence in the Environment Agency
 - Carbon balance and likelihood of securing use for heat
 - Track record of operator
- Topics relevant to planning decision
 - Need for such facilities and site identified in Minerals and Waste Core Strategy
 - Flood risk and “Sequential test”
 - Other “material considerations”: Concerns about risks to health; traffic impacts; nature conservation impacts; visual appearance; air quality; water quality
- Cost to Council: over £30m, plus delay in securing sustainable solution
 - Norfolk County Council will soon start sending waste to incinerator in Suffolk

- South London Waste Partnership
 - Croydon, Kingston, Merton and Sutton
 - Viridor appointed waste disposal contractor
- Facility located in Sutton, close to meeting point of Sutton/Merton/Croydon
- Air quality impact:



- Air quality impact



Proposed South London ERF

- Public concerns were most vocal around air pollution and health...



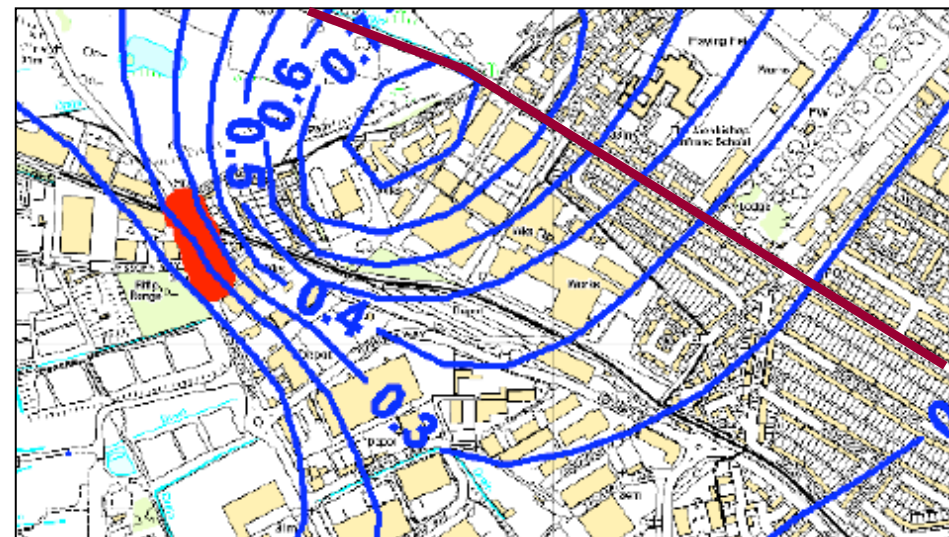
- ... with traffic, recycling and visual impacts also important
- Context: community had expected a country park following minerals extraction, and then an end to waste-related traffic by 2023.



- View from highest point of Mitcham Common

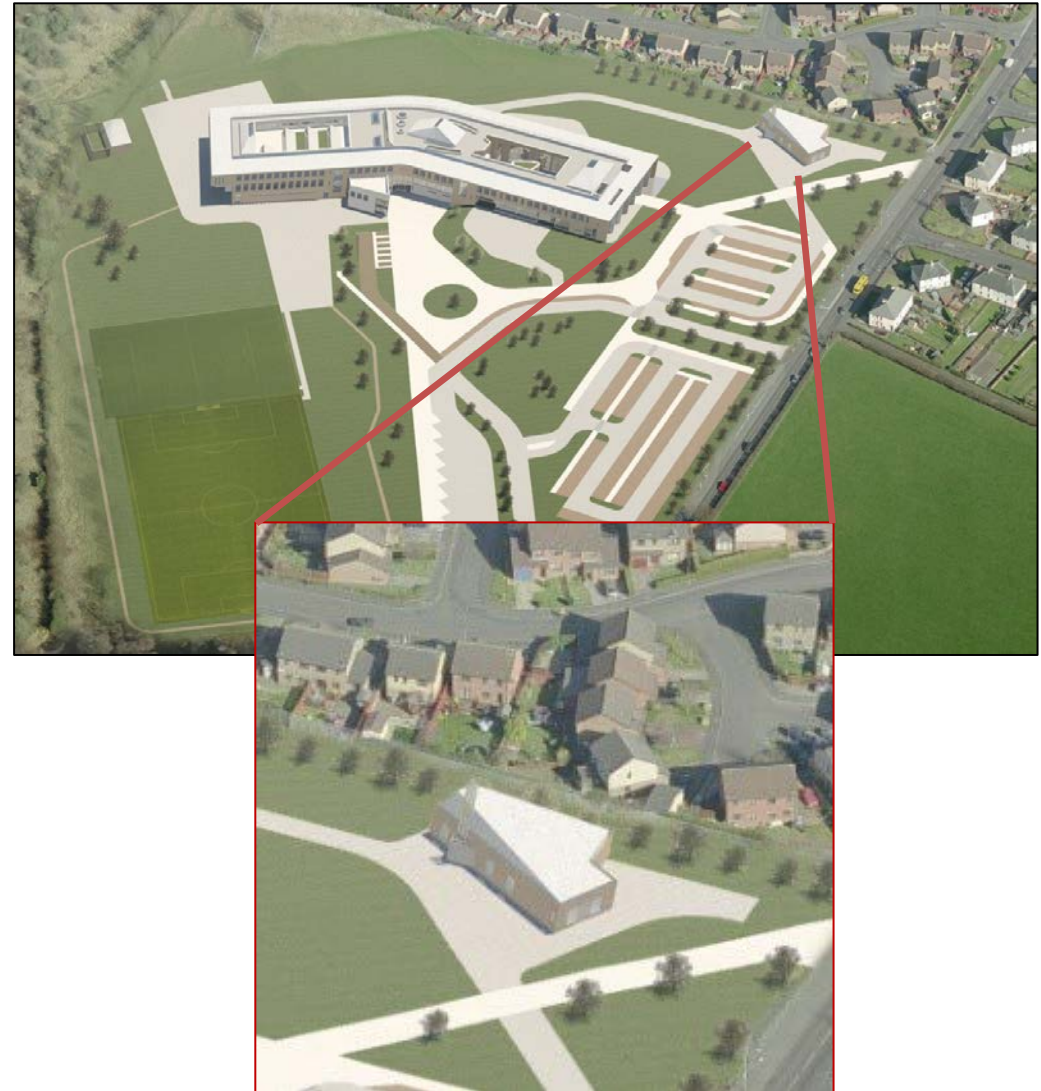


- Ricardo-AEA advisors to LB Sutton as planning authority on AQ, nature conservation and health
 - Impact could not be screened out as “insignificant,” as contribution to nitrogen dioxide $>1\%$ AQO in an area where baseline levels $>100\%$ AQO
 - Applicant redesigned process to reduce NO_x emissions and increase stack height
 - No significant air quality impacts
 - No significant risks to health
- Questions from the planning committee:
 - Impacts in Croydon vs Sutton?
 - How much NO_x would be emitted? How far would it disperse?
 - How does it compare to burning plastics on a bonfire or domestic fire?



- Genuinely-held concerns – but not relevant for the planning process
 - Health risks
 - Scale of proposed facility: impact on recycling
 - Technology choice
 - What if things go wrong? - Lack of confidence in the Environment Agency
 - Carbon balance
 - Previous promises and undertakings for return of site to public use
 - Track record of operator in local community and elsewhere
- Topics relevant to planning decision
 - South London Waste Plan safeguards the site for continued waste management use
 - Impact on Air Quality Management Area
 - Fear of harm can be a material consideration, given weight if objective evidence
 - Traffic impacts
 - Visual appearance
 - Metropolitan Open Land: *“The strongest protection should be given to London’s Metropolitan Open Land and inappropriate development refused, except in very special circumstances.”*

- Two secondary school redevelopments
 - Clyde Valley Campus
 - Greenfaulds
- New campuses each included a biomass plant to provide heat and electricity input
- Ricardo-AEA carried out assessments of the biomass plant to confirm design
 - Main focus of opposition to new development
 - Proposed location was adjacent to residential properties
 - Scottish air quality standards for PM_{10} and $PM_{2.5}$



- Conclusions on air quality
 - Good baseline air quality
 - Proposed developments comply with air quality standards
 - Increased proposed flue height for one scheme to reduce contribution
 - Nitrogen dioxide and PM₁₀/PM_{2.5} similar significance
 - NO₂ would be more significant in Wales or England
- Residents called for biomass centre to be moved
- Alternative locations evaluated
 - Some better, some less good for air quality
 - Practical considerations meant that alternative locations were less favourable
- Availability of detailed evidence on air quality was important for success of planning application
- Now under construction



Air quality impact of EfW and biomass: key issues

● Conclusions

- Well established assessment techniques are available
- Good location, sizing, design, operation, monitoring are essential
- Key air quality issues:
 - Baseline air quality
 - NO_x and PM₁₀ likely to be important in urban areas
 - Cadmium, arsenic, nickel, chromium VI typically important
 - Impact on habitats (especially European sites) is increasingly important
- Other issues requiring assessment
 - Dioxins and furans
 - Other Industrial Emissions Directive pollutants
 - Traffic emissions
- Other issues
 - Non-standard operating conditions
 - Regulation and monitoring

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- Cumulative impacts of biomass plant...



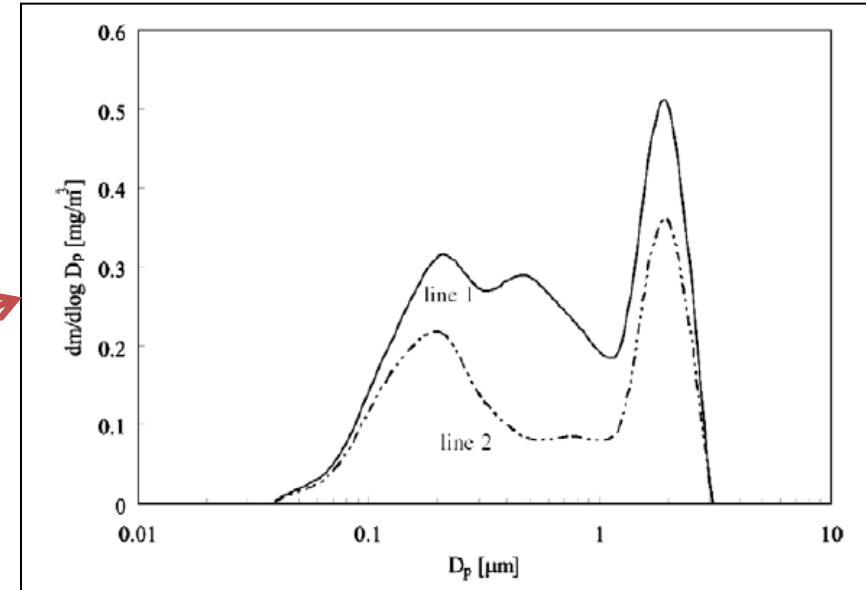
- Small-scale biomass combustion plant gives rise to emissions including NO_x , PM_{10} , $\text{PM}_{2.5}$.
- Could potentially result in a significant aggregate impact e.g. across an urban area
- Conversion of large-scale fossil fuel power stations to biomass
 - Clean wood: NO_x /PM comparable to coal-firing
 - Recycled wood: WID / IED limits for waste incineration
 - Compatibility of abatement plant with new fuel
- London policy
 - Plant <0.5MWth too small to warrant abatement: show no adverse impact
 - Plant >0.5MWth must use BAT: cf gas-fired boiler
- A specific biomass policy and information requirement table is useful for developers & officers
- EPUK/LACORS/AEA guidance on biomass
 - Air quality impacts can be controlled through good process design
 - Biomass more appropriate in rural areas off the gas grid
 - Biomass should be less common in urban areas and AQMAs
 - Climate and air quality policy may be in conflict
 - Management and mitigation of biomass emissions



- Key issues:
 - Infant mortality
 - Nanoparticles/ultrafine particles
 - Dioxins and furans
 - Carcinogens and cancer risk
- Alleged link between **infant mortality** and incineration/combustion processes
 - Maps produced to emphasise difference “upwind” and “downwind” of incinerators
 - Other factors much more important: no basis to these allegations
 - Recent review (Ashworth et al., August 2014) found possible links between older/ problem plant and adverse birth and neonatal outcomes
 - E.g. Tango et al. (2004): dioxin emissions were 800x permitted levels in Europe
- Health concerns over emissions of **Dioxins and furans**
 - Control of dioxins and furans is now well understood
 - Need to be properly assessed using quantitative exposure modelling
 - Can normally be demonstrated to be insignificant

- Health concerns over **nanoparticles/ultrafine particles**

- All combustion processes emit nanoparticles
- MSW incineration: < 0.1% of UK emissions
- Main sources in the UK: traffic, open wood burning, natural sources
- Slight contribution from EfW to local public exposure – remains insignificant
- Nanoparticles in EfW emissions are abated: UK data would be welcome
- Chemical composition of nanoparticles from EfW: field data welcome



- **Carcinogens/cancer risk:**

- SEPA/NHS Scotland: *“There may have been an association between emissions ... in the past from ... waste incinerators and some forms of cancer ... the magnitude of any past health effects ... is likely to have been small ... any risk to the health of a local population living near an incinerator, associated with its emissions, should also now be lower.”*
- Some problem sites/some evidence for detectable increases in risk at older sites
- E.g. Garcia-Perez et al (2013): minimal data on MSW incineration; some misclassification and location of sites; confounding from other industrial emissions and occupational exposures

- “Is incineration safe?”
 - Overall, properly designed and operated EfW should have no significant or material effects on health
 - There remains a range of concerns among the public and decision-makers:
 - Many concerns don’t hold water
 - Further work on composition of ultrafine particles would be useful
 - Effective communication is difficult
 - Scientific evidence is complex
 - Health risks are not zero, but are not significant or detectable for current plant
 - Past record does not always inspire confidence
 - Many people respond well to an honest discussion of the issues
 - *“I can’t think of anything else to ask” ... “You’ve made things much clearer.”*
 - Generalised health concerns should not hold up development of EfW ... and usually don’t

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