Eco Park Surrey Project Overview

The Eco Park and Air Quality

Outline of the Presentation

- Project overview
- Process Description
- National Air Quality Objectives
- Eco Park and the Environment Permit
- Air Pollution Control and CEMS
- The Eco Park and Air Quality in Spelthorne

Project Overview

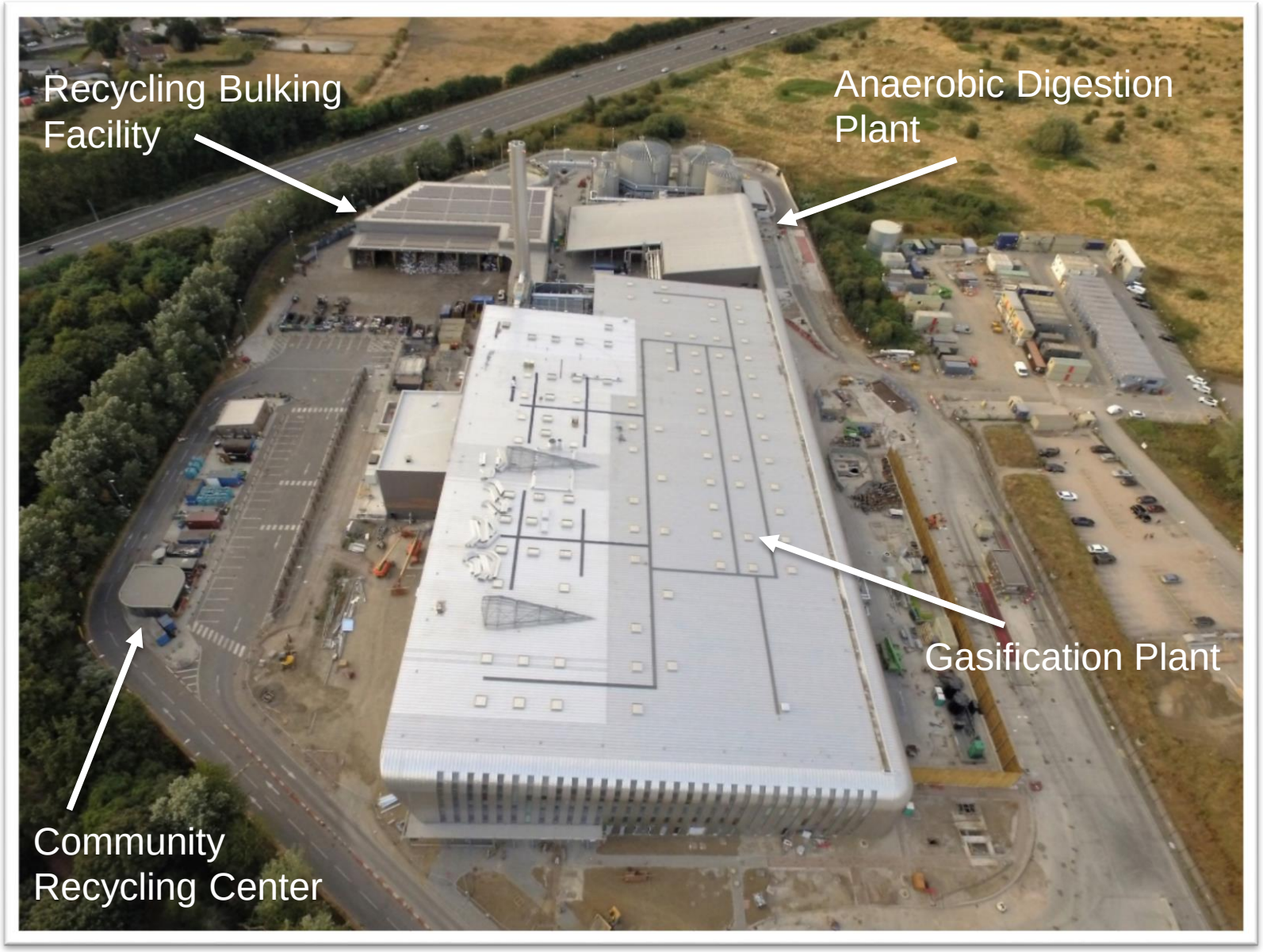
Project Overview

- **Sept 1999:** Surrey County Council awarded a Waste Management Contract to SUEZ for 25 years. Proposed solution is based on an integrated waste management solution including 2 EfW facilities.
- **2001 & 2008 :** Planning failed twice
- SUEZ operates 15 recycling centres, 5 waste transfer stations, landfilling and out-of-County disposal contracts.
- **2010 :** First discussions on an Eco Park solution
- 31-Oct-2013: NTP1 (Basic Engineering)
- 2015: Planning Approval - Repricing due to expiry of Long-stop date: £70M to £91M
- 19-May-15: NTP2 (Construction)
- 2-Jun-15: Start onsite
- 14-Jul-17 (forecast: end Dec 18): AD Take Over
- 24-Oct-17 (forecast end Dec 18): Gasification Take Over

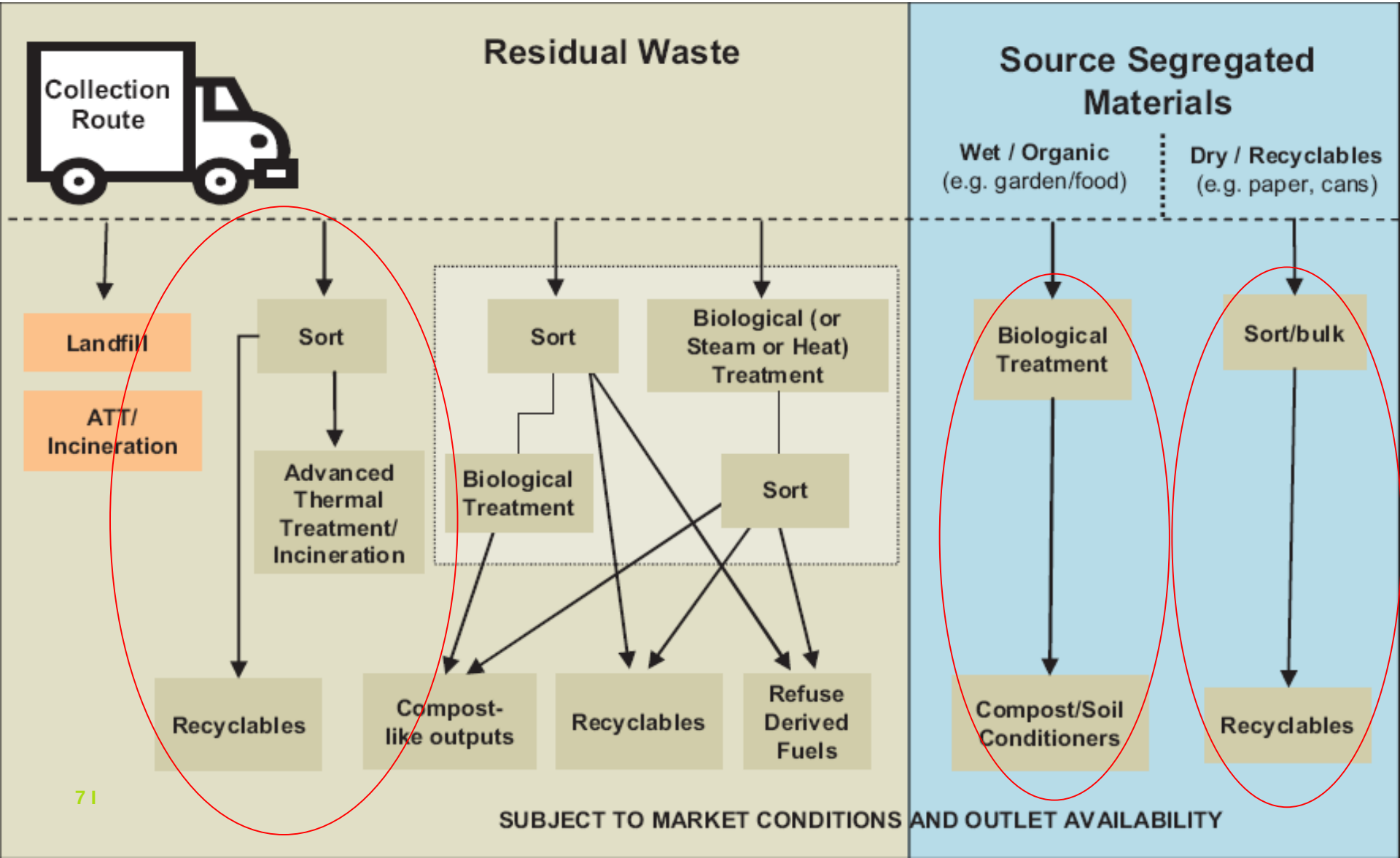
Eco Park Surrey

- New technology (≠ EfW)
  - Gasification
  - Anaerobic digestion
- Small size
  - 100 kt per annum
- Integrated
- Local solution
- In Surrey

Layout

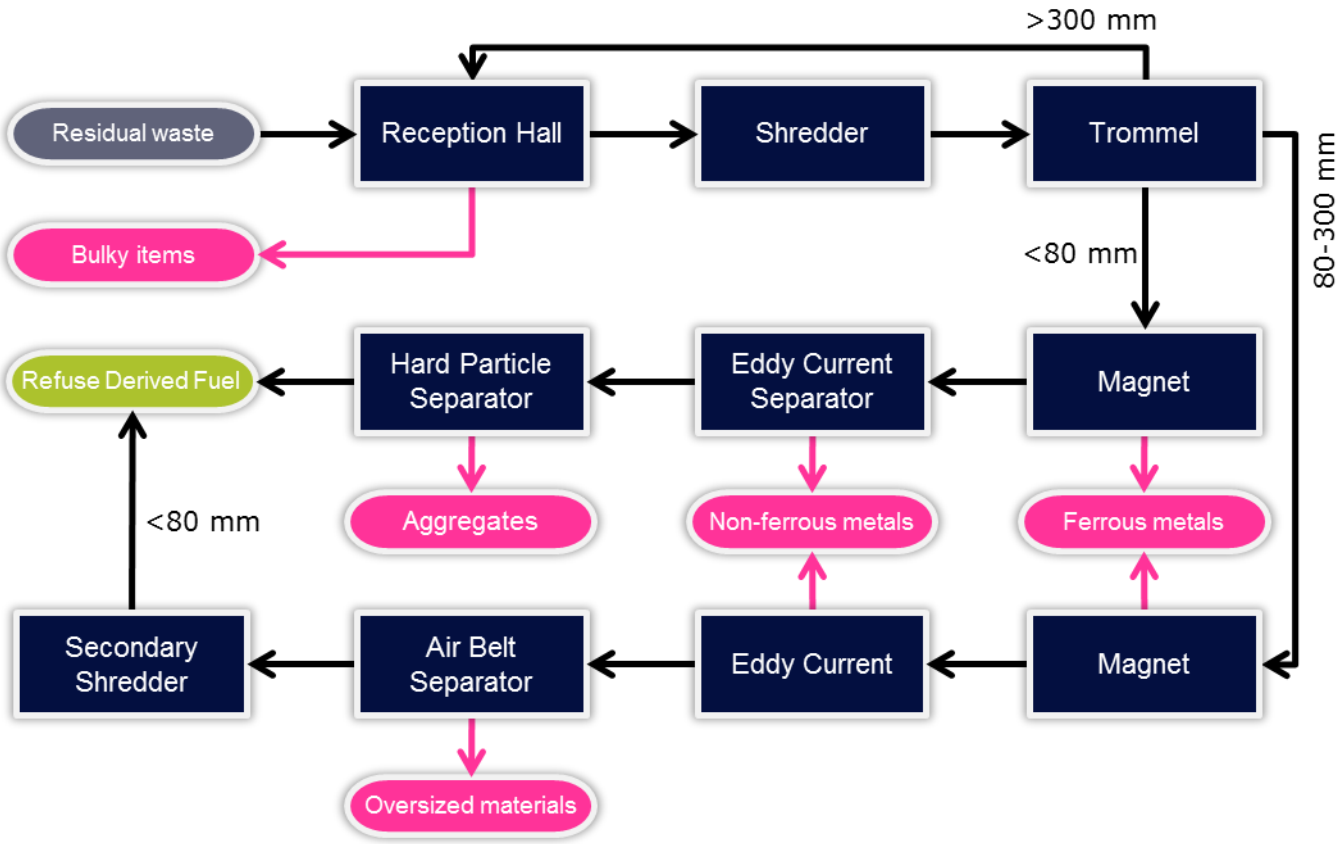

Recycling Bulking Facility
Anaerobic Digestion Plant
Gasification Plant
Community Recycling Center

Recycling and Recovery at the Eco Park



Process Description

Pre-Treatment



RDF Manufacture (Pre-treatment)

Shredding
- MSW input to shredder 55kt/yr

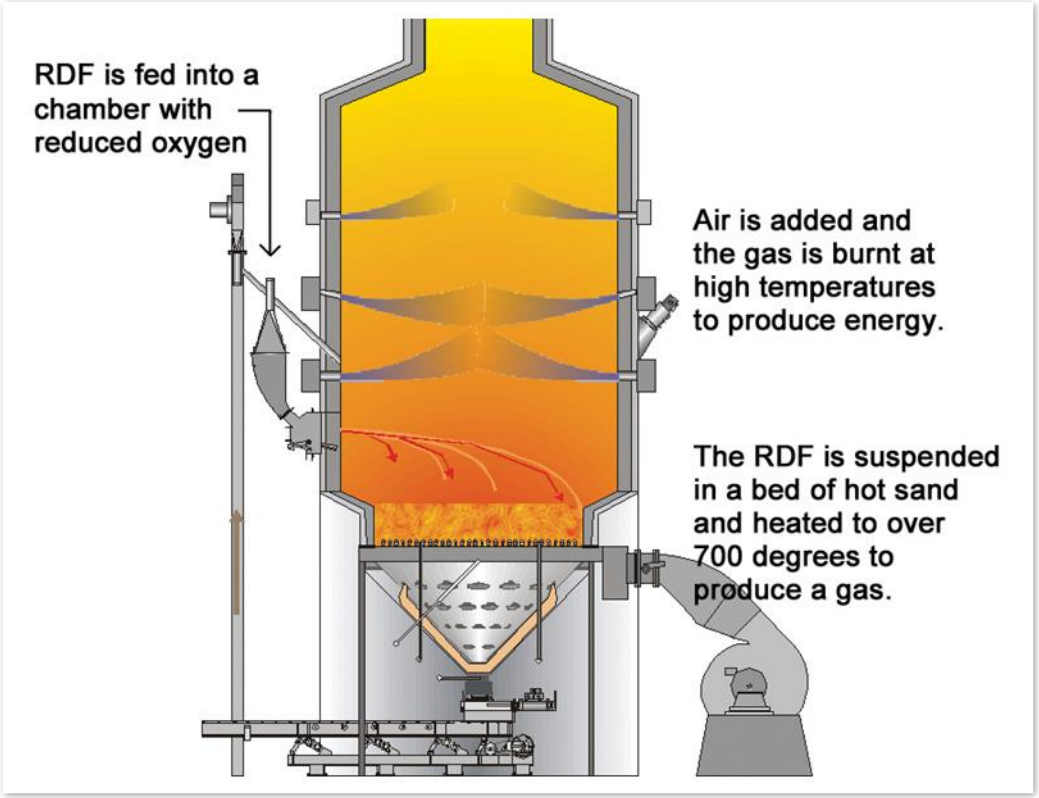
Metals Separation
- Ferrous
- Non-Ferrous

Others
- Aggregates
- Residual (Carpet, shoes etc.)

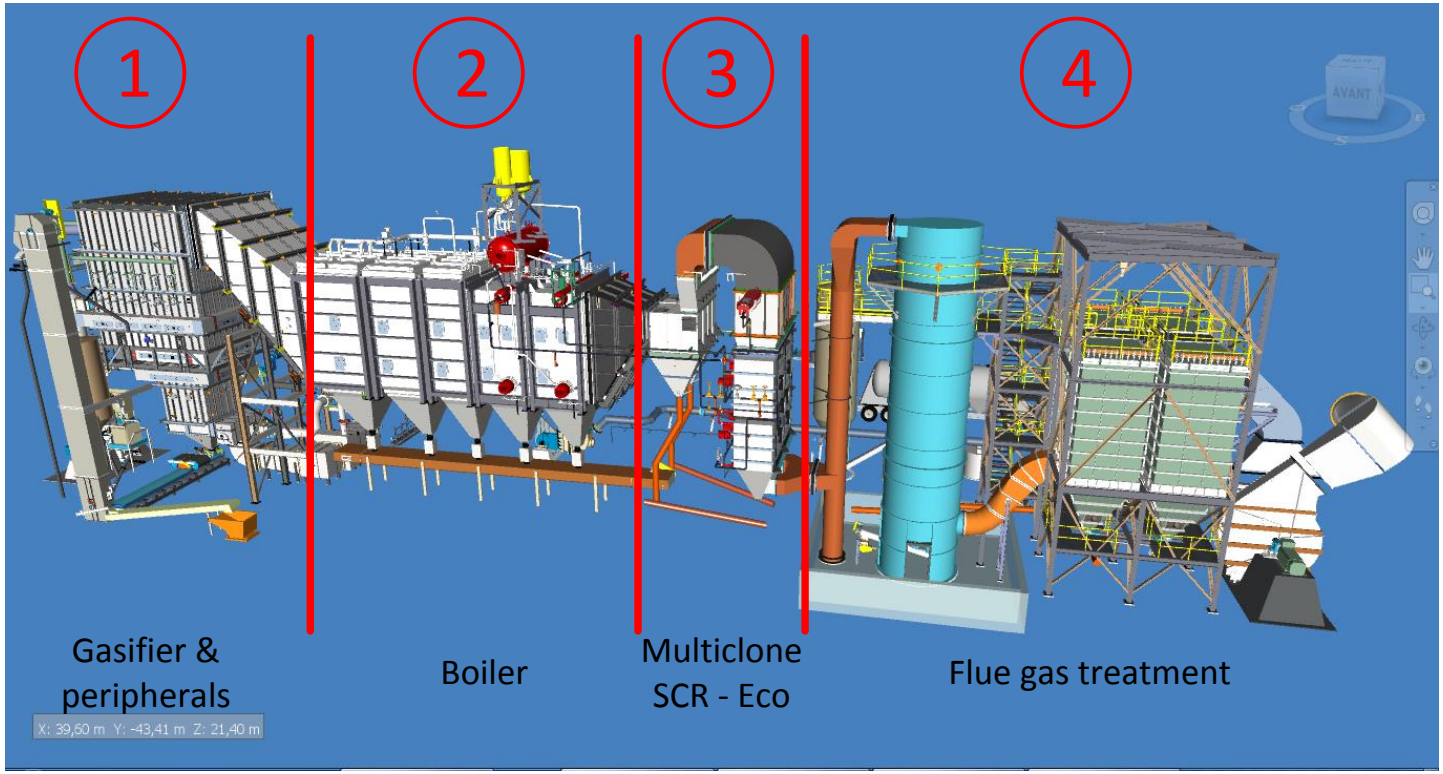
RDF
- Refuse Derived Fuel 45kt/yr

Gasification

- Fluidised Bed
- Refuse Derived Fuel
- Processing 45ktpa
- 5.6 t/h x 10.3 MJ/kg
- 17.5 t/h steam
- @ 405 C – 43 bar
- 3.65 MWe Gross
- 2 - 2.4 MWe Net



Gasification Process Overview



Anaerobic Digestion

- 40,000 tpa
- Process stages
  - Pre-treatment
  - Hydrolysis
  - Pasteurisation
  - Anaerobic digestion
  - Dewatering
- Other functions
  - Liquor treatment
  - Biogas handling
  - Odour control
- Gas produced is burned in two CHP gas engines:
  1.8 MWe Gross (1 MWe Net)

National Air Quality Objectives

Pollutants with National Air Quality Objectives

- In England there are air quality objectives for seven pollutants:
  - Nitrogen Dioxide (NO2)
  - PM10
  - Carbon Monoxide (CO)
  - Sulphur Dioxide (SO2)
  - Benzene
  - 1,3-butadiene
  - Lead
- Previous local air quality assessments in Spelthorne have shown that concentrations are compliant with the relevant objectives,
  - With the exception of Nitrogen Dioxide

Pollutants with National Air Quality Objectives

Pollutant	Concentration	Averaging period	Permitted exceedances each year
Nitrogen dioxide (NO2)	***200 µg/m³***	***1 hour***	***18***
	40 µg/m³	***1 year***	***n/a***
PM10	***50 µg/m³***	***24 hours***	***35***
	40 µg/m³	***1 year***	***n/a***
Fine particles (PM2.5)	***25 µg/m³***	***1 year***	***n/a***
Carbon monoxide (CO)	10 mg/m³	Rolling 8 hour mean	n/a
Sulphur dioxide (SO2)	350 µg/m³	1 hour	24
	125 µg/m³	24 hours	3
Benzene	5 µg/m³	1 year	n/a
Butadiene	2.25microg/m³	running annual mean	
Lead (Pb)	0.25 µg/m³	1 year	n/a

About NOx

- Mixture of nitrogen dioxide and nitrous oxide, known as NOx.
- Primary health effects are respiratory.
- Main emission sources
  - Road transport
  - Power stations
- High ambient concentrations are almost always associated with high traffic densities.

About PM10

- PM10 is dust or particulate matter with a diameter smaller than 10 microns.
- Studies have shown increases in mortality associated with high levels of PM10s as well as short term respiratory effects.
- Main emission sources
  - Road transport
  - Quarrying
  - Combustion processes

About PM2.5

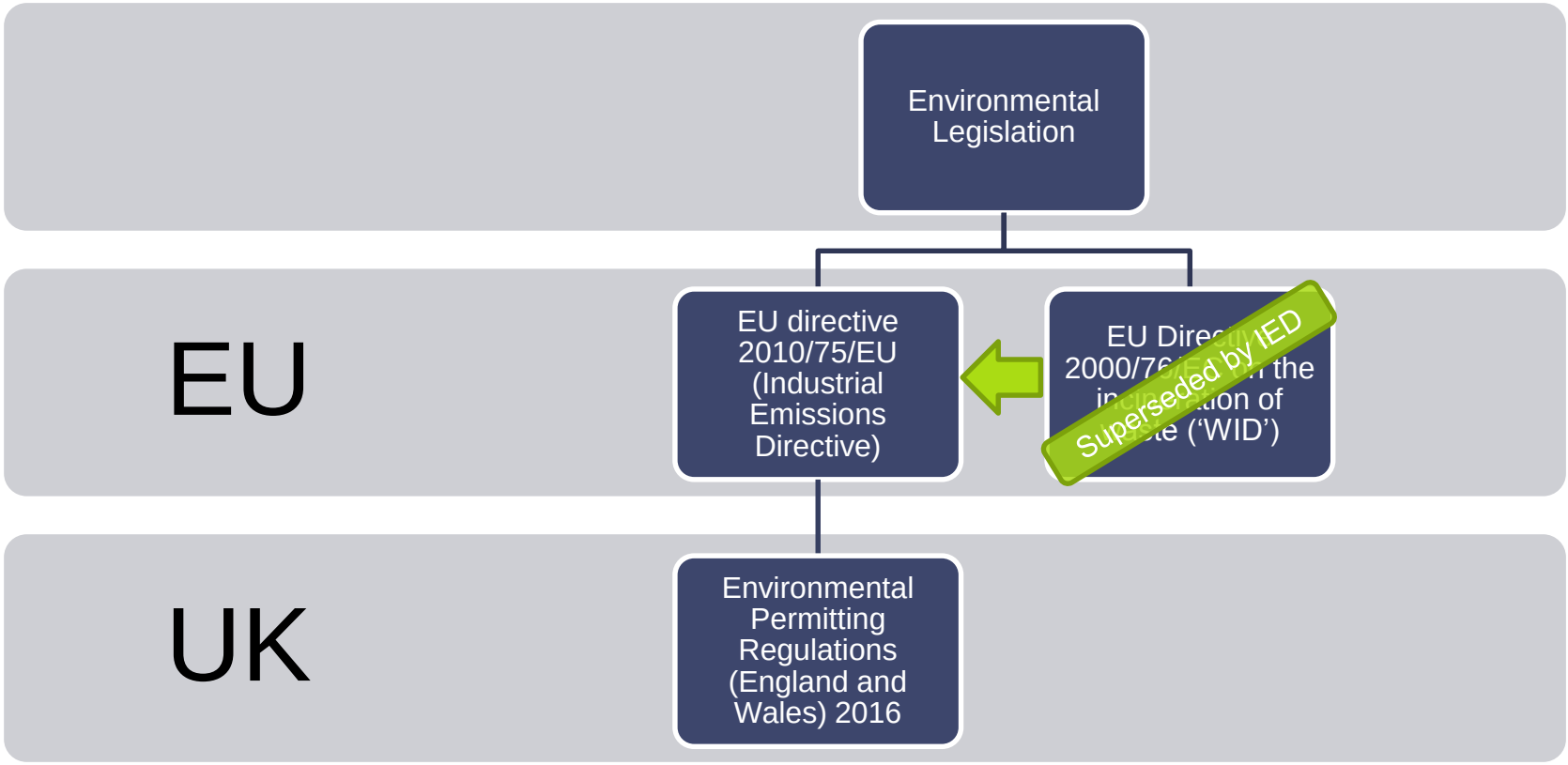
- PM2.5 is dust or particulate matter with a diameter smaller than 2.5 microns.
- PM2.5 is a fraction of PM10.
- Health effects are similar to PM10, but there is some evidence that the PM2.5 fraction has greater impacts than PM10.
- Main emission sources
  - Road transport
  - Combustion processes

Air Quality Monitoring Station

- Analyser installed at a location along Birch Grove, Shepperton.
- Purpose: to establish baseline conditions before operation of the Eco Park and monitor conditions during the operation.
- Equipment installed:
  - NO_2 (Nitrogen dioxide) – Monitor Labs Chemiluminsecence analyser ML9841b;
  - PM_{10} – Met-One BAM 1020 PM10
  - $PM_{2.5}$ – Met-One 1020 smart BAM for PM2.5;
  - Wind Speed and Direction – Ultrasonic from Gill Instruments Ltd; and
  - Logger – Campbell Logger
- NO_2 and PM_{10} analysers installed and commissioned on 23rd March 2016. $PM_{2.5}$ and wind analysers on 17th May 2016.

Eco Park and the Environment Permit

Governing Legislation



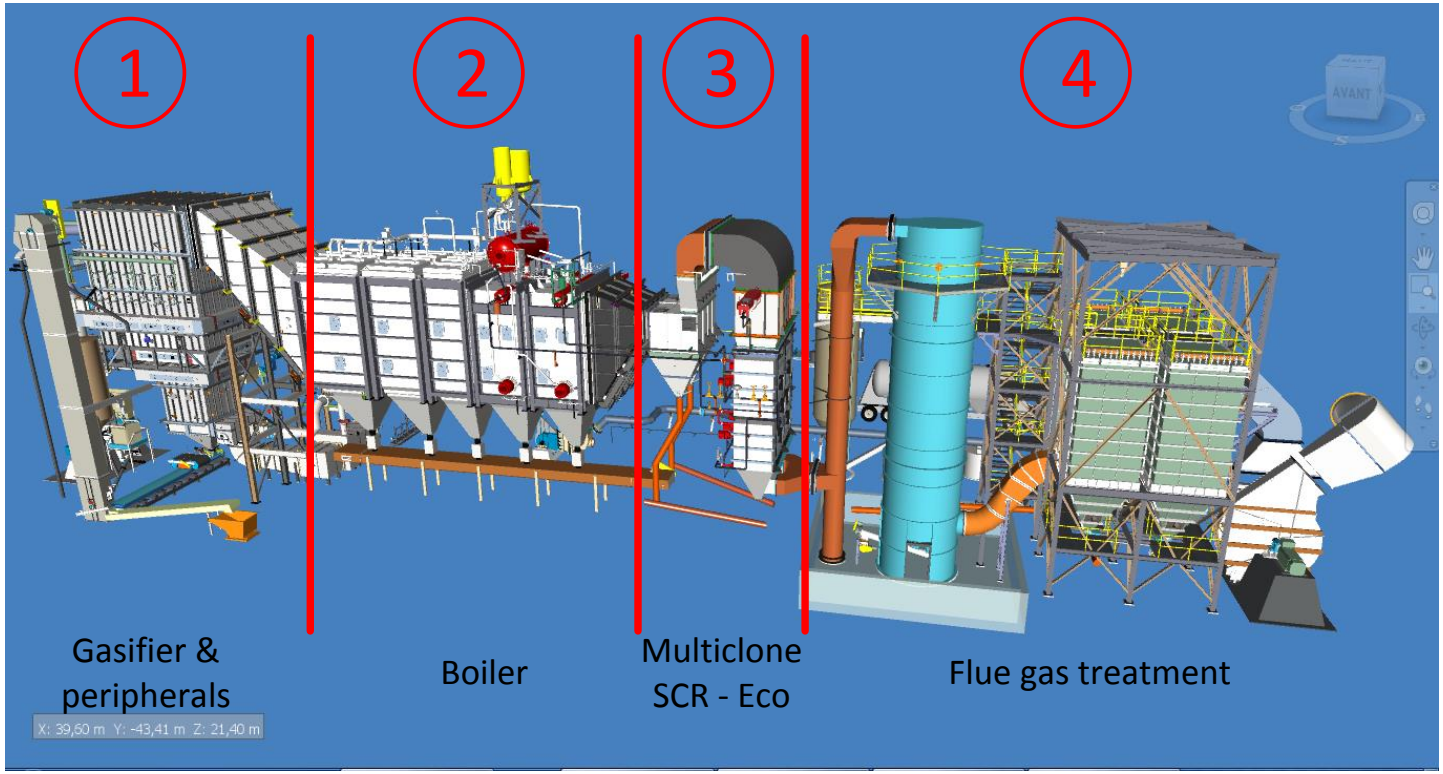
The Eco Park Permit-

- Single permit covering all operations on site
- Defines:
  - How we must construct the site
  - How we can operate
  - What wastes we can accept
  - What we can emit
  - How we must monitor our emissions
  - That we must regularly review operations to determine if improvements can be made
- Issued and applies since 29th October 2014

- Operations:
  - A1: Gasification
  - A2: Anaerobic Digestion
  - A3: Electricity generation (Gasifier Turbine)
  - A4: Electricity generation (AD Plant CHP engines)
  - A5: Use of auxiliary flare on the AD Plant
  - A6: Community Recycling Centre
  - A7: Recyclables Bulking Facility
  - A8: Road Sweepings Bulking Facility

Air Pollution Control and CEMS

Air Pollution Control of the Gasifier



Continuous Monitoring

- Emissions to Air
  - Continuous Emissions Monitoring System (CEMS)
    - NOx
    - SOx
    - Ammonia
    - Total Organic Carbon (TOC)
    - CO
    - HCl
    - Particulates
  - Limits imposed for both ½ hourly averages as well as daily average
- Process Monitoring
  - Facility Distributed Control System (DCS)
    - Combustion Chamber Temperature (>850°C)
    - Exhaust Gas Temperature
    - Exhaust Gas Pressure
    - Exhaust Gas O_2
    - Exhaust Gas H_2O

CEMS System

- Continuous measurement of exhaust gas at the base of the stack
- Dual redundant systems
- Will be MCERT certified
- Periodic parallel sampling carried out by external consultants to validate measurement

Periodic Monitoring

- Gasification (A1)
  - Emissions to Air: HF, Cd & Tl, Hg, Heavy Metals, Dioxins/Furans & PCBs, Polycyclic Aromatic Hydrocarbons (PAHs)
  - Emissions to Land:
    - Bottom Ash (TOC, metals, Dioxins/Furans & PCBs);
    - APCr (metals, Dioxins/Furans & PCBs);
    - Boiler Ash (metals, Dioxins/Furans & PCBs);
- AD Plant
  - Emissions to Air (CHP Engines & Flare): NOx, SO_2, CO, VOCs)

Abnormal Operations

- Activity A1 (Gasification) only:
  - Must be recorded
  - Defined as:

> "abnormal operation" means any technically unavoidable stoppages, disturbances, or failures of the abatement plant or the measurement devices other than continuous emission monitors for releases to air of particulates, TOC and/or CO, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.

  - Must shutdown process if:
    - Total “abnormal operation” exceeds 60hrs/calendar year.
    - An individual period of “abnormal operation” exceeds 4 hrs.
    - Limits of Particulates, TOC and/or CO during abnormal operation are exceeded
    - Particulates, TOC and/or CO parts of CEMS system are offline

Potential Impact of the Eco Park on Air Quality

Eco Park AQA Model Assumptions

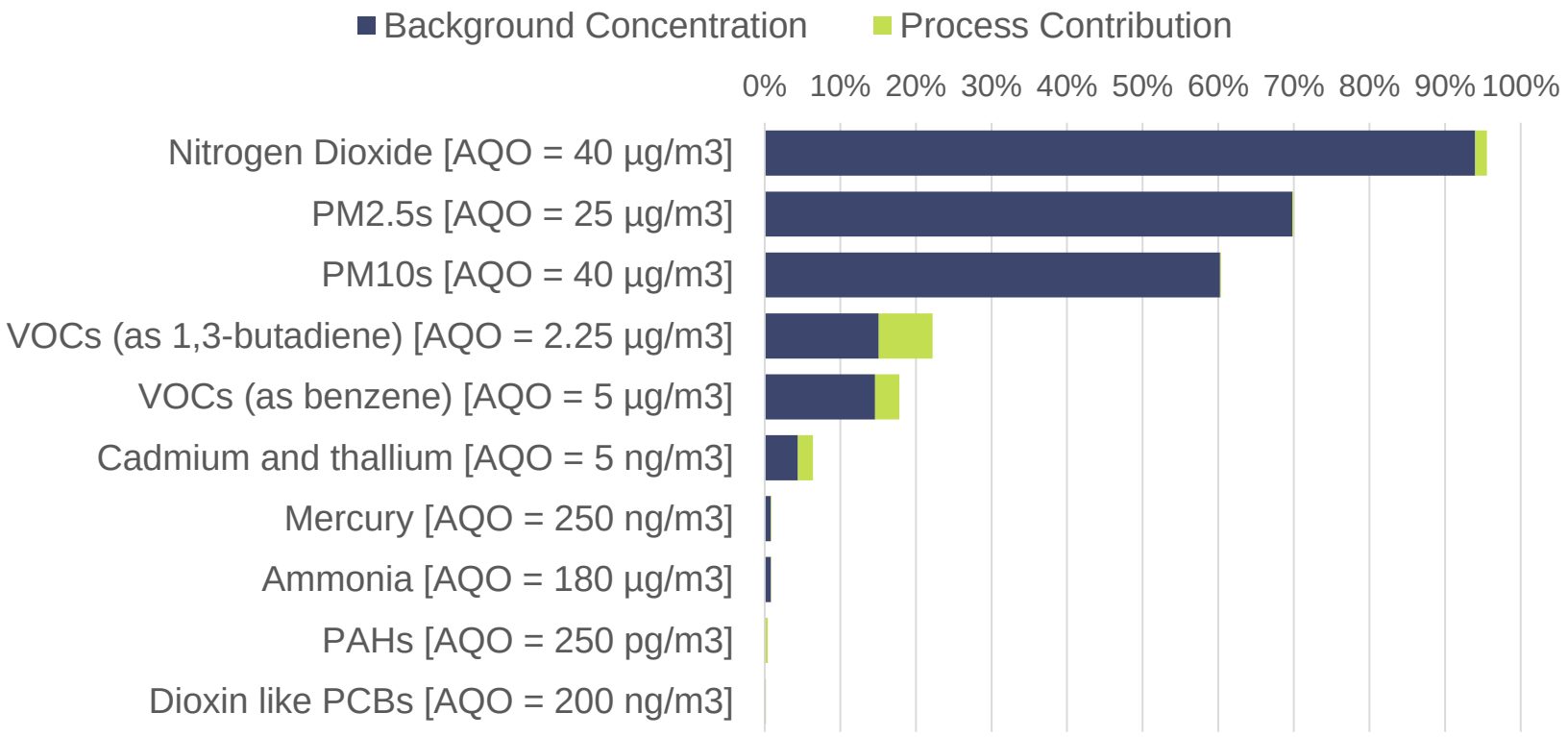
- Both the AD and Gasification Processes are expected to comply with the permit
- As worst case scenario, emissions assumed to be equal to the permitted emissions limits
- The emissions limit for Nitrogen Oxides (100 mg/Nm^3) is lower than that prescribed within the Industrial Emissions Directive (IED)
- More detail is available on the Air Quality Assessment Report, which is part of the Environment Permit for the Eco Park

Eco Park AQA Model Inputs

	Gasification Plant		Gas Engines (x2)	
	Conc. (mg/Nm³)	Release Rate (g/s)	Conc. (mg/Nm³)	Release Rate (g/s)
Oxides of nitrogen (as NO2)	100	0.928	300	0.286
Sulphur dioxide	50	0.464	350	0.333
Particulates	10	0.093	-	-
Carbon monoxide	50	0.464	1,400	1.333
Hydrogen chloride	10	0.093	-	-
Hydrogen fluoride	1	0.009	-	-
Volatile organic compounds (as TOC)	10	0.093	1,000 (75 as non-methane)	0.952 (0.071)
Ammonia	10	0.093	-	-
Cadmium and thallium	0.05	0.464 µg/s	-	-
Mercury	0.05	0.464 µg/s	-	-
Other metals	0.5	4.640 µg/s	-	-
Benzo(a)pyrene	0.0001	1.856 ng/s	-	-
Dioxins and furans	0.1 ng ITEQ/m³	0.928 pg/s	-	-
Dioxin like PCBs	0.005	0.0464 µg/s		

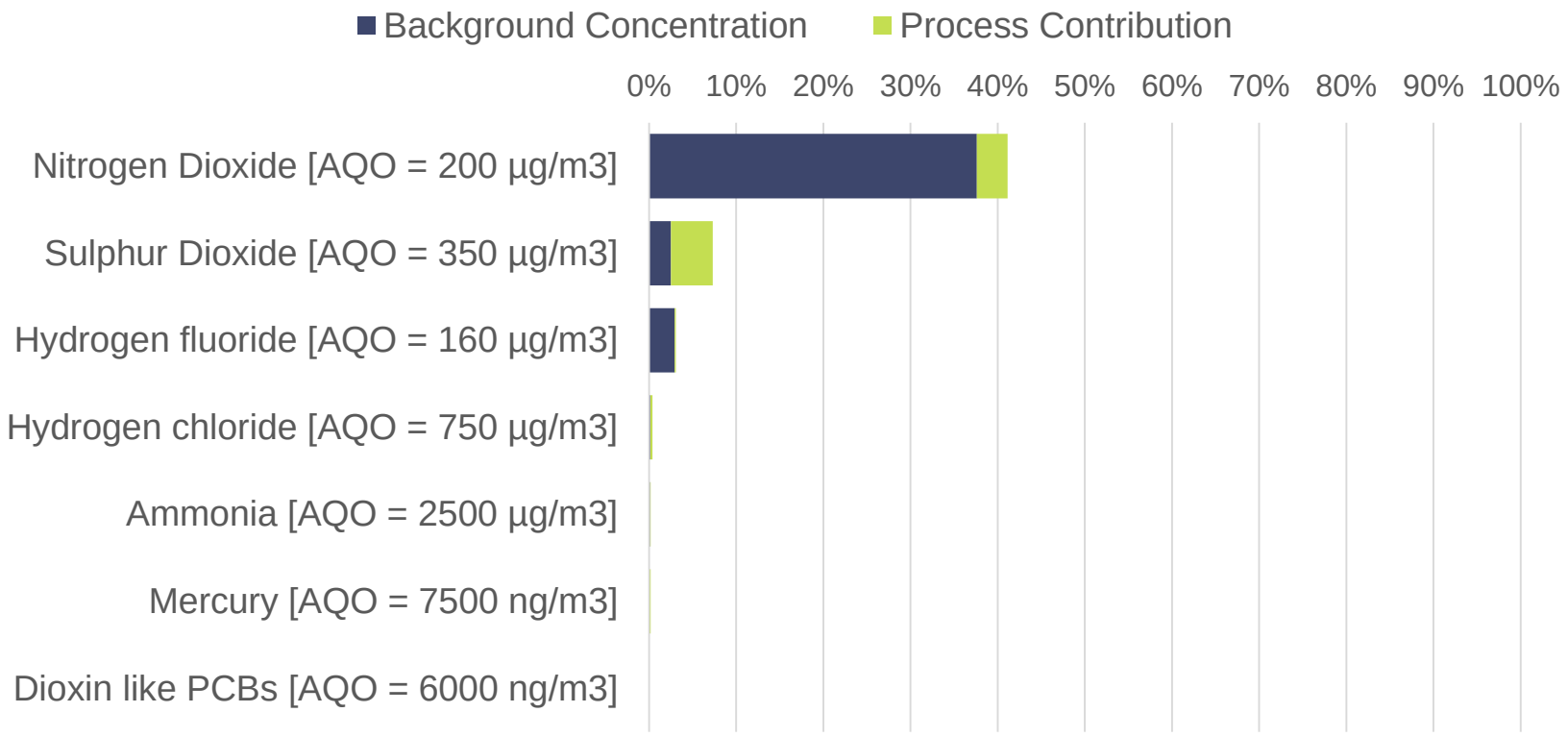
Eco Park Contribution to Air Quality

Measured in Annual Means



Eco Park Contribution to Air Quality

Measured in Hourly Means



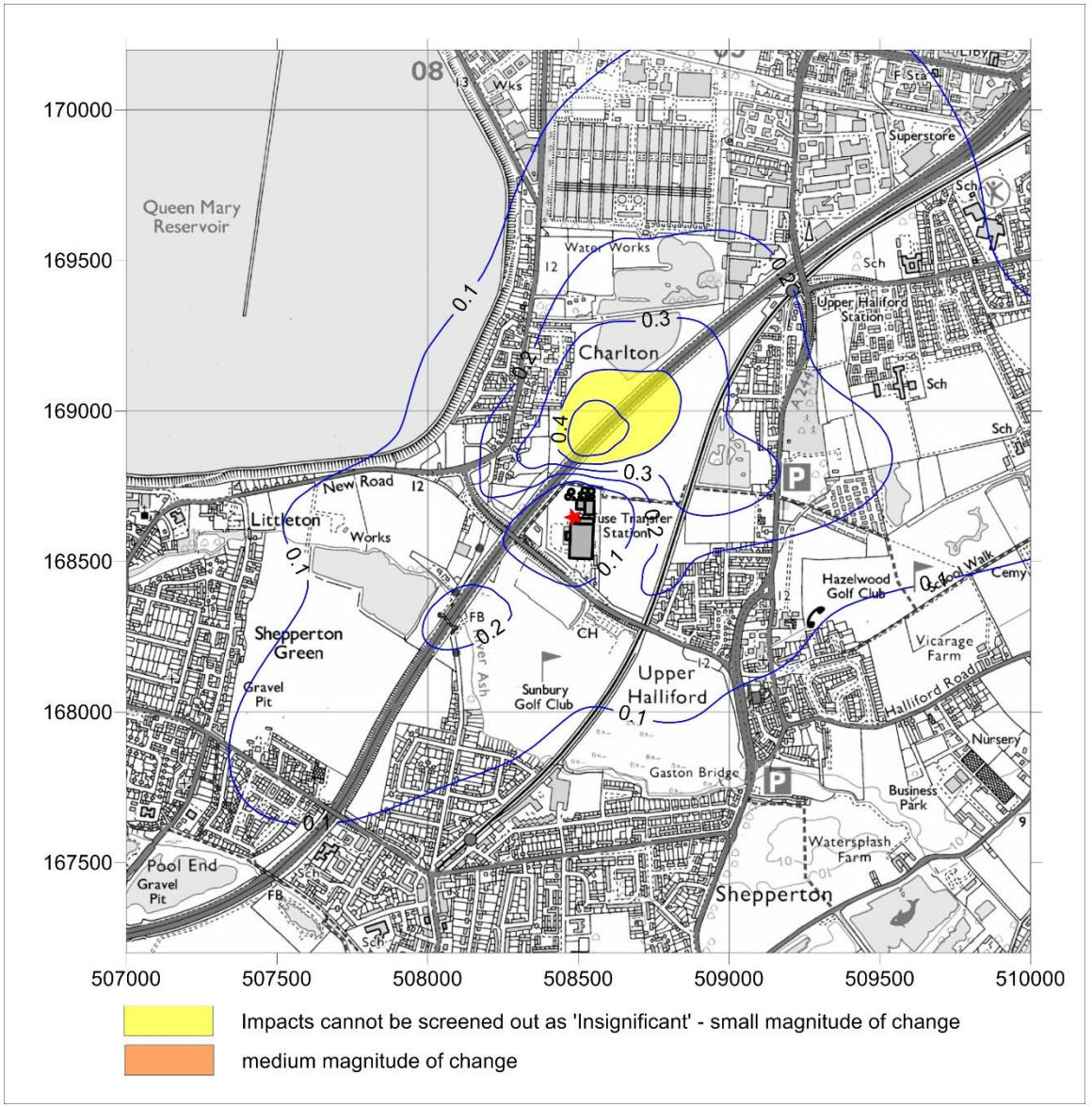
Eco Park Contribution to Air Quality

Results

- Emissions from the Facility will not cause a breach of any Air Quality Objective
- Under the Environment Agency Screening Criteria, all but the 4 emissions below could be classed as “insignificant”
  - Annual Mean Nitrogen Oxides
  - Annual Mean VOCs (as benzene)
  - Annual Mean VOCs (as 1,3-butadiene)
  - Annual Mean Cadmium
- These were further assessed on the Air Quality Assessment:
  - All impacts are based on a worst-case assumption, hence actual impact will be lower than as modelled (e.g. the entire non-methane VOCs assumed to be only benzene or 1,3-butadiene)
  - NOx impact where there are residential properties is insignificant

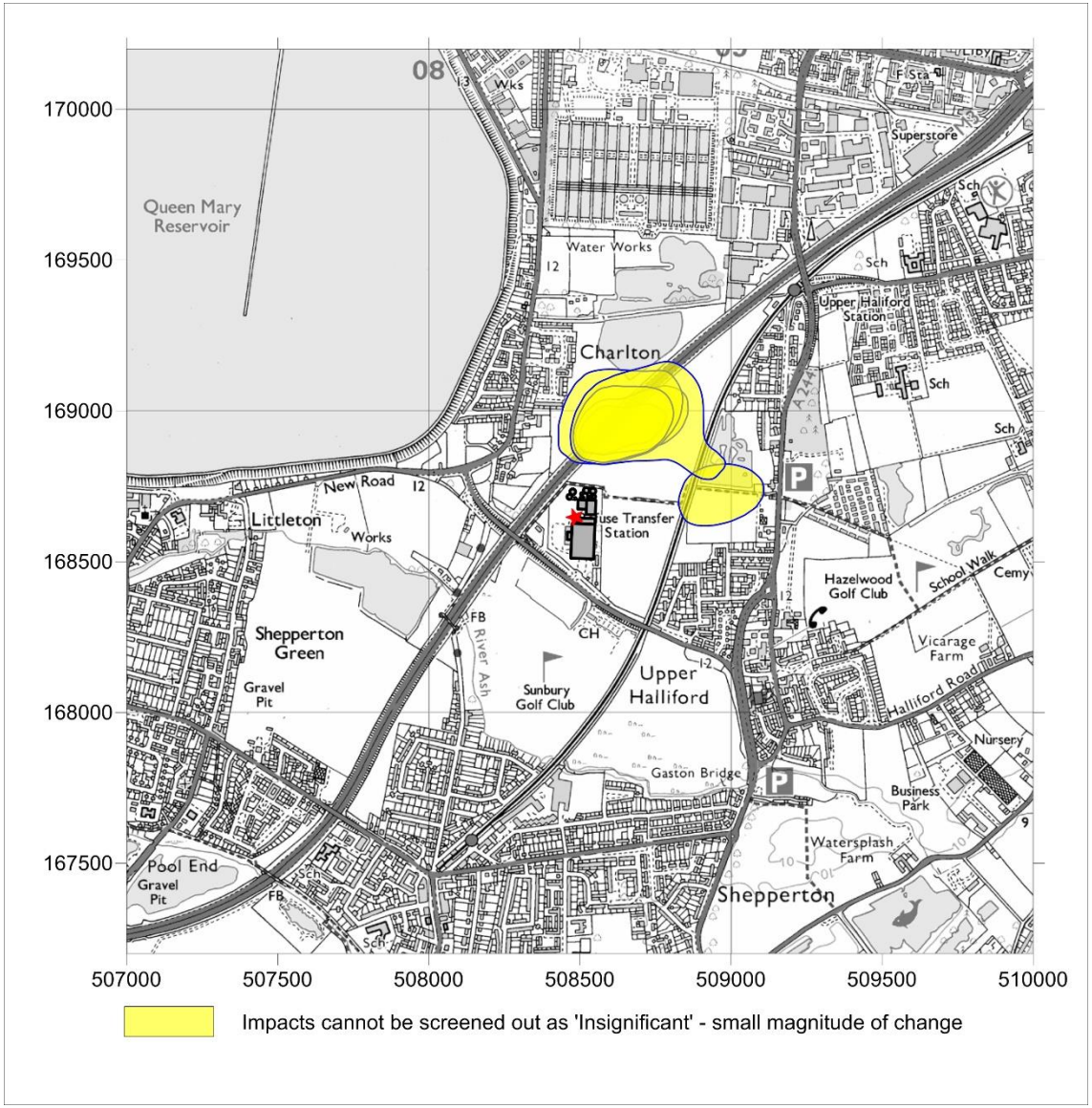
Dispersion Diagram

- Shows Annual Mean NO2 process contribution.
- Based on 2006 weather data, which was worst case.
- Shaded area is >1% of the air quality objective.
- Assumes 100% availability, operating at emission limit.



Dispersion Diagram

- Shows areas where impact is >1% of air quality objective.
- Shows all weather data considered.
- Assumes 100% availability, operating at emission limit.



End of Presentation