Caulmert Limited

Engineering, Environmental & Planning
Consultancy Services

Daneshill Soils Treatment Facility

FCC Recycling (UK) Limited

Odour Management Plan

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DISCLAIMER

ODOUR MANAGEMENT PLAN

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1 INTRODUCTION

1.1 Report context

1.1.1 FCC Recycling (UK) Ltd (hereafter referred to as the 'Operator') operate Daneshill Landfill Site, which is located approximately 2km east of Lound Village, Nottinghamshire at National Grid Reference SK6755086750.

1.1.2 Caulmert Limited were appointed by the operator to prepare an application to vary the existing permit: EPR/NP3538MF to include a Soil Treatment Facility (STF) which will operate on a newly constructed compost pad within the landfill site boundary. In addition to the STF, the Operator proposes a number of variations to add the following listed activities to the current permit:

- Section 5.3A(1)(a)(i) - Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving biological treatment;
- Section 5.3A(1)(a)(ii) Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment;
- Section 5.4A(1)(a)(i) - Disposal or recovery of non-hazardous waste with a capacity exceeding 10 tonnes per day involving biological treatment;
- Section 5.6 Part A (1) (a) – Temporary storage of hazardous waste with a total capacity exceeding 50 tonnes pending any of the activities listed in Sections 5.1, 5.2 and 5.3;

1.1.3 In addition to the details above, this odour management plan (OMP) has also been written to support a planning application whereby a Scoping Opinion request for the Soil Treatment Facility was made by Barton Wilmore in October 2019. A reply was received on 12th November 2019 from the Waste Planning Authority (WPA), Nottingham Council. The Scoping Opinion established that the proposed development was not in a sensitive area, although it exceeded 0.5ha in plan area and therefore is required to be assessed for any significant effects on the environment, including odour. The Operator are required to submit an OMP to consider the impact of odour on receptors as a result of the construction and operational activities of the STF. This OMP provides means of assessing the effectiveness of control measures. The proposed Odour Action Plan should be implemented in cases of failure and odour events. This document looks at current procedures for investigating odour events and includes reference information on the understanding of odour nuisance.

1.1.4 The OMP has been prepared in reference to the Environments Agency's Technical Guidance Note H4 Horizontal Guidance for Odour[1] and the recommended Best Available Techniques (BAT) for odour control at waste management facilities.

[1] Environment Agency. March 2011. Technical Guidance Note IPPC H4 Horizontal Guidance for Odour (Parts 1 & 2).

1.2 Standards and Guidance Relating to Odour Nuisances

1.2.1 There are no statutory standards for odour, currently the Environment Agency have published their guidance, Environmental Permitting: H4 Odour Management.

1.2.2 This guidance makes relevance to measures necessary to prevent or minimise odour pollution (if prevention is not practicable). Where appropriate measures to take will depend on the industry sector and site-specific circumstances with reference to costs and benefits.

1.2.3 There are two distinct types of odour nuisance covered under UK legislation: 'statutory nuisance' and 'odour nuisance likely to cause a loss of amenity', with the main legislation in respect of odour generation being the Environmental Protection Act (EPA) 1990.

1.2.4 Enforcement of the Act (in regard to nuisance), is currently under the jurisdiction of the EA, Environmental Health Department, whose officers are deemed to provide an independent evaluation of nuisance.

1.2.5 Whilst there are no European or UK specific regulatory standards for the assessment of the impact of odours. It can be reasonably argued that loss of amenity and complaints are likely to occur when odours become detectable and recognisable. To be a statutory nuisance the odour needs to be seen to be affecting the comfort or enjoyment of the complainant's property or the public at large and the source of the odour also needs to be beyond reasonable doubt.

1.3 Soil Treatment Operations

1.3.1 The STF is proposed to accept and process a maximum 29,999 tonnes per annum of hazardous soils containing visible bound pieces of asbestos and/or hydrocarbons and 20,001 of non-hazardous soils. The soils treated will be used for the restoration of the wider Daneshill Landfill site. The usual maximum treatment time for soils is 6 months in general with the majority being treated in periods of between 8-16 weeks. The STF will operate within the footprint of the Daneshill Landfill Site permit as shown in drawing ref; 4239-CAU-XX-XX-DR-V-1804.

1.3.2 The treatment areas consist of 2 treatment pads measuring at 3000m^2 and 3000m^2 for biotreatment/physical treatment and another 1 x 4000m^2 treatment pad solely for screening/processing. An indicative operational layout of the treatment and processing area and cross section is detailed in drawing refs: 3982-CAU-XX-XX-DR-V-1806, 3982-CAU-XX-XX-DR-V-1807 and 3982-CAU-XX-XX-DR-V-1808.

<u>Bioremediation Process Description</u>

1.3.3 The biological treatment process varies between 8 to 16 weeks, dependent on the contaminants present in the soil.

1.3.4 Bioremediation of soils will be undertaken on a newly constructed geo-composite clay lined crushed treatment pad with sealed drainage to holding tanks. The treatment pad has an appropriate fall to allow all process water to be collected in a precast concrete covered gully.

As there is no drainage network on site, all process waters will be pumped to on-site holding tanks with excess water tankered off to an appropriate disposal facility.

1.3.5 Soils accepted at the STF are deposited by tipper lorry on the treatment areas. The soils are arranged into stockpiles for initial testing to ensure compliance with the client's waste description, these are managed using a system of batches/lots which allows the waste to be categorised by age and trackable from the point of origin to its location on the treatment pad and subsequent treatment.

1.3.6 Bioremediation of soils refers to the biological treatment of contaminated soils by creating optimal conditions for biodegradation of contaminants. To enable biodegradation to occur the following parameters are monitored and manipulated:

- pH
- temperature,
- moisture content,
- oxygen level
- nutrient concentrations

1.3.7 Biodegradation of the organic contaminants is carried out by microorganisms in the soil. This can be enhanced by addition of very low concentrations of inorganic nutrients such as ammoniacal nitrate and organic material such as woodchip. Management of moisture content is also essential for microbial activity; low moisture content will inhibit microbial growth, but excessive moisture can restrict airflow. The perforated aeration pipes located beneath the waste will extract air from the biopile to effectively control soil oxygen levels and moisture content to maintain aerobic conditions (i.e. oxygen levels >10%).

1.3.8 Temperature in the biopiles is maintained between 30 and 40°C to ensure the mesophilic microflora are predominately stimulated, optimising biodegradation.

1.3.9 The stages of the bioremediation process are detailed below:

- Initial Placement: The soil deposited on the treatment pad will be formed into a biopile by a 360 excavator.
- Addition of Nutrients: Based on the contaminants present within the soil, nutrients are added to facilitate the biological degradation of the hydrocarbon compounds.
- Chemical Analysis – Approximately every 4 weeks the soil is analysed for contaminant concentrations to determine whether the biological treatment of the soil is adequately reducing the hazardous contaminants to non-hazardous concentrations. Additional nutrients and/or organic inputs may be added to expedite the process.
- Nutrients testing – Every 2-4 weeks the soil is analysed for nutrient levels within the soil to ensure that there is sufficient inorganic and organic material to facilitate the biodegradation process. This is supported by the chemical analysis of the soil for contaminant concentrations.
- De-compaction of the soil – Every 4-8 weeks the biopile will be turned to facilitate aeration of the soil.

- Validation testing: Once the soil meets the re-use criteria, the soil is removed from the treatment pad and transferred to the non-hazardous soils storage area or directly to the landfill.

1.3.10 On receipt of validation testing that confirms the soil meets re-use criteria, it is transferred to the non-hazardous soils storage area, disposed in the adjacent landfill void or reused on site as restoration soils. The treated soils are stored externally as shown on Site Layout Plan, pending disposal or removal off-site

Asbestos Treatment Process Description

1.3.11 The processing of soils with asbestos debris is predominantly undertaken on soils with no volatile or potentially odorous inclusions.

1.3.12 Soil is initially received by tipper lorry and placed on the treatment pad and sampled to ensure the client's initial waste description is correct. Whilst the results are awaited the soils are sheeted to prevent wind borne dust or any odour emissions from occurring.

1.3.13 Soils with no potential for odours will be subject to screening and asbestos picking as stated within the operating techniques for the permit.

1.3.14 Soils with the potential for odours will be assessed further to establish if screening or hand picking will give rise to odours that can be detected at the site boundary. If odours are deemed possible at the site boundary as a result of screening or hand picking then the soils will be rejected from site. There will be no acceptance of soils at the site that would give rise to odours during the asbestos screening and picking treatment works.

1.4 Air Quality Impact Assessment

1.4.1 An air quality impact assessment (AQIA) was undertaken for the proposed development. The scope of the assessment was to consider the potential air quality impacts on human health from the emissions of VOCs.

1.4.2 With respect to odour, the report concluded that:

"The predicted odour at the nearest sensitive receptors are well below the odour detection threshold for all pollutants".

3 POTENTIAL ODOUR SOURCES

3.1 Sources

3.1.1 The contaminated soils accepted on site may contain odorous substances, it is considered that the asbestos element in asbestos containing soils is unlikely to be a source of odour, however the soils could present an odour source. Odour may present a nuisance to surrounding human receptors or cause an adverse impact to the environment.

3.1.2 The current and proposed activities associated with the STF that have the potential to produce odorous emissions are:

- Delivery of waste to site and deposit onto the treatment pad and initial pre-acceptance assessment;
- Bioremediation of potentially contaminated soils including initial formation, aeration and turning;
- Biopile emissions via biofilter and/or treatment of surface waters
- Screening and hand picking of soils; and,
- Storage and transfer of residual material removed from screening process.

3.1.3 Soils accepted for treatment can potentially contain odorous organic substances due to the presence of the following hydrocarbons:

- range of petroleum hydrocarbons (petrol, heating fuel, diesel, used oils, crude oil etc.);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- creosote;
- phenols; and
- chlorinated solvents and other Volatile Organic Compounds (VOCs).

3.1.4 The wastes types to be accepted at Site are set out in within the Permit Application. Odorous contaminants known to be difficult to either; treat to a level with no residual odour (e.g. chlorinated phenols), or effectively control/eliminate odours from, will not be accepted for treatment.

3.1.5 During biotreatment, the optimum temperature, oxygen and moisture conditions for the treatment process will be maintained to reduce the odour emissions potential. An absence of sufficient oxygen within the piles may lead to the biodegradation of the material under anaerobic conditions, increasing the potential for malodourous emissions. The current bioremediation method maintains optimum aerobic conditions in the waste by continuously extracting air through the soil to ensure consistently aerobic conditions to be maintained with optimal oxygen levels. This allows optimal contaminant mineralisation to take place.

3.1.6 Extracted air is passed through a biofilter to remove odorous contaminants. This filter operates continuously and removes approximately 99% of the monitored volatile organic contaminants that have the potential to cause odour. An Emissions Management Plan (Document ref: 3982-CAU-XX-XX-RP-V-0307) is in place with details on monitoring on site to confirm the effectiveness of the biofilter process.

4 POTENTIAL ODOUR PATHWAYS

4.1 Meteorological conditions

4.1.1 It is considered that the principle mechanism for the transit of odour emissions from site activities to nearby sensitive receptors is likely to be via airborne. Meteorological conditions will heavily impact and determine the level of risk and exposure to sensitive receptors. The following factors are likely to influence the risk:

Wind Direction & speed

4.1.2 The dominant wind direction determines which receptors are likely to be impacted and levels of exposure. Wind speed will affect the likely distances odours can be transported, however, in contracts increased wind speed is likely to dissipate odours.

Ambient air temperatures

4.1.3 Higher temperatures and warmer conditions can result in an increased risk of odour emissions from site. Staff will be trained to be vigilant of meteorological conditions and those likely to encourage odour emissions.

5 POTENTIAL RECEPTORS

5.1 Local Sensitive Receptors

5.1.1 The Site is centred on national grid reference SK6764786722 within a flat lying land resting on highly permeable sand/gravel and Sherwood Sandstone deposits. The location of the proposed activity relative to the surrounding area is shown in the Site Location Plan drawing ref; 3982-CAU-XX-XX-DR-V-1801.

5.1.2 The proposed STF site is in a predominantly agricultural setting of which Loundfield Farm is located 500m to the east. Other nearby residential and domestic dwellings include a few properties and a travellers site located on Daneshill Road. Industrial/ commercial properties such as Retford Ready Mix Limited (concrete suppliers) and Retford Dismantlers (used trucks) are located 330m south and 440m south-south-east from the site. Recreational activities including the Daneshill Sailing Club is located 520m west from the site boundary which utilises the Daneshill Local Nature reserve and lakes as part of its activities.

5.1.3 The site is bound by a number of populated settlements; the village of Lound 1.5km south east, Torworth Village 1.8km west, Mattersey village 2.6km north-north-east and the largest of the four settlements, Ranskill located 1.9km north-west from the site boundary.

5.1.4 A review of the prevailing wind direction has identified that the most dominant wind is from the south-west/south-south-west towards north-east/north-north-east. The wind direction is likely to blow towards Mattersey Village and agricultural fields. Given the distance from the site boundary and the transient nature of odours from site, it is considered that receptors are unlikely to be impacted as odours are likely to dissipate in this distance.

5.1.5 A search within 500m did not locate any Special Protection Areas (SPA's), Specials Areas of Conservation (SAC's), Areas of Outstanding Natural Beauty (AONB), National Nature Reserves (NNR's) RAMSAR Sites, Ancient Woodlands or World Heritage Sites.

5.1.6 There are no Air Quality Management Areas (AQMA's) in the vicinity of the site.

5.1.7 The site is located on river material classified by the Environment Agency as a secondary A aquifer of which is further underlain by the Chester Formation, part of the Sherwood Sandstone Group and which is classed as a principal aquifer.

5.1.8 The potential receptors within 500m of the site boundary are provided on Drawing 3982-CAU-XX-XX-DR-V-1800 and are summarised in Table 1.

Table 1: Potential Receptors identified within 500m of the site boundary

Receptor	Activity	Distance from site	Direction from site
Traveller's Site	Residential	155m	SWS
Daneshill Road	Public road	250-500m	S, W, SW
Retford Ready Mix Limited	Industrial premises (concrete plant)	330m	S
Daneshill Lakes Nature Reserve	Nature Conservation	400m	W
Retford Dismantlers	Industrial vehicles dismantling	440m	W
Loundfield Farm	Residential	495m	E
Mattersey Hill Marsh SSSI	Nature Conservation	500m	NW
Residential properties off Daneshill Road	Residential	500m	SW
Daneshill Sailing Club	Recreational	520m	W
Scrap Yard	Industrial	860m	NW

Surface Water

5.1.9 The closest surface water feature is a stream approximately 460m to the West of the site, which flows North into the River Idle. There are two fisheries in the surrounding area, Clearwater Lake fishery located 1.1km North of the site boundary and Lakeside fisheries located 1.1km north west.

5.1.10 Daneshill Lakes Nature Reserve is located 400m West of the site boundary, in which there are several small lakes where the area is used for recreational use and sailing.

5.1.11 The site is not located within a flood risk zone.

6 WASTE OPERATIONAL ODOUR CONTROLS

6.1 General Control Measures

Waste Acceptance

6.1.1 In general, the pre-acceptance checks on soil enquiries (i.e. review of the waste description, analysis etc) will exclude soils deemed to pose an odour nuisance. However, whilst this conservative approach has been shown on the Applicant's other operational site to be effective there are occasional loads that will have a detectable odour where mitigation measures will need to be implemented to prevent odours from leaving the immediate boundary of the STF.

6.1.2 To ensure odours are kept to a minimum during the initial reception of waste, each load of waste will be inspected on delivery to ensure the waste conforms to the waste description initially provided by the producer. Any non-conforming waste, including malodorous wastes, will be either removed from the site, or subject to on-site odour mitigation. On-site mitigation measures will only be implemented if that mitigation method is known to be entirely effective in preventing odours from affecting the identified receptors.

6.1.3 Waste types with the following waste codes have been identified by the EA as being potentially malodourous and so will be audited at the source to assess their odour potential, prior to being granted approval to supply the site with material. These waste streams will also be screened upon arrival to the site to identify any potentially malodourous emissions that could potentially give rise to odour complaints:

- 19 02 05; Filter cake
- 19 12 11; Hydrocarbon impacted wastes

6.1.4 Please also refer to Soil Reception Procedure in Appendix 1

6.1.5 Drop heights of all received waste will be minimised as far as practicable during the loading and unloading of materials to reduce the likelihood of dispersion and minimise the potential for odour release as a consequence of agitation.

Waste Treatment & Storage

6.1.6 The bioremediation process relies on continuous management of the materials temperature, moisture content and oxygen content in order to facilitate biodegradation under aerobic conditions. To maintain these optimal conditions and ensure odours are kept to a minimum during this stage of treatment the following procedures will be implemented:

- Installation of a biopile air extraction system, a network of perforated aeration pipes installed beneath the waste biopiles. These are linked to a vacuum blower system. An air/water separator is fitted within the collection system to remove liquid from the process air extracted from the biopile. The process water is pumped from the separators

via an automated pump with automatic level detection system to an enclosed process water tank for primary settlement and carbon filtration prior to discharge to foul sewer.

- The air extraction system is connected to a biofilter to capture and treat any extracted VOCs and volatile degradation products and reduce particulate and odour emissions. The biofilter comprises a moist and nutrient enhanced oversize compost medium filter covered with an impermeable tarpaulin. The biofilter has exhaust holes to allow gaseous emissions to be released.

- The air extraction system will be regularly monitored and maintained. The biofilter will be monitored for the following parameters on a monthly basis:
    - VOCs (including BTEX)
    - Speciated PAHs
    - TPH

- The air sample analysis will be undertaken before and after the biofilter to demonstrate that ~99% of monitored contaminants are continuously removed during the operation of the STF. The biofilter is operational 24 hours per day.

- The biofilter will also be regularly checked and maintained to ensure appropriate media particle size, temperature and moisture content. Equipment will be calibrated in accordance with manufacturer's instructions or as agreed with the Environment Agency. These procedures will maintain and effective air extraction system, reducing odour emissions and identifying any leaks or damage for repair. Compliance with this requirement will be demonstrated by the monthly biofilter monitoring and regular VOCs monitoring at the site.

6.1.7 Operational controls will be in place to ensure no turning of the biopiles with any potentially odorous soils is undertaken during high winds which could have the potential to increase odour emissions downwind.

6.1.8 Soil screening will only be undertaken on soils which have already been characterised to ensure that no odorous contaminants are present This is to ensure that any odorous contaminants are absent and that no odours can be generated as a result of the soil screening/hand picking process.

Bioremediation processes

6.1.9 Absence of oxygen during the bioremediation process could lead to anaerobic conditions developing within the soils, generating odorous compounds. To ensure this is minimised, optimum conditions are maintained to avoid anaerobic decomposition. This is regulated by carrying out routine monitoring to ensure oxygen levels are present at all times.

6.1.10 Biodegradation is optimised by maintaining a temperature in the biopiles of between 30°C and 40°C to ensure microflora are stimulated. The biopile Air Extraction System comprises of a network of perforated aeration piles installed beneath the waste biopiles which are connection to a vacuum system. The air extraction system is connected to a biofilter to capture and treat the degradation products and reduce particulate and odour emissions. The biofilter comprises a oversize compost filter with exhaust hole to allow gaseous emissions to be released.

6.1.11 Operational controls during the bioremediation process will be in place to ensure there is no turning of the biopiles during high winds blowing towards sensitive receptors (Loundfield Farm, c.495m E from the site boundary).

6.1.12 As part of the bioremediation process, extracted air is passed through a biofilter which removes odorous contaminants. The biofilter is maintained on a regular basis in line with manufacturers specifications to ensure optical conditions for the removal or odours/volatile organic compounds. Strict controls including maintaining ideal moisture and temperature conditions, nutrient concentrations, pH and matrix particle size for the biofilter are in place.

6.2 Control Measures - Abnormal Operating Scenarios

Equipment Breakdown or Malfunction

6.2.1 Breakdown of malfunction of the loading and screening equipment could potentially result in the material being left for extended periods of time (e.g. 1-2 days). The impact of this will depend on the length of time of the breakdown, the waste types and volume of waste being processed and weather conditions i.e. particularly high temperatures or prolonged periods of heavy rainfall etc.

Control Measure

6.2.2 In the event of a plant failure or malfunction, alternative earthmoving equipment is normally available immediately on site or from the adjacent landfill area. Where this is not the case, the equipment will be repaired, or replacement plant hired in as soon as practicable. In the event that the biopile blower equipment malfunctions, the material will continue to be managed to ensure odours do not develop until a replacement can be fitted or the repairs completed.

6.2.3 It is rare for the equipment to fail, based upon experience and the simplicity of the equipment used; repairs are generally completed within 24-48 hours due to the wide availability of replacement parts. Planned deliveries of waste will be managed during this period and postponed if necessary.

6.2.4 It needs to be noted that contaminated soils received at the site have a very low organic content and do not produce any significant level of secondary odours from anaerobic degradation processes. The contaminants present within the soil are deemed the source of any potential odour. During periods without active aeration, there is rarely, if ever additional odours noted. In addition, all soils at site are formed into managed stockpiles to reduce the exposed area for potential emissions as far as practicable in the event that aeration is interrupted for a short period of time.

6.2.5 All plant and equipment will be maintained and regularly serviced in accordance with the manufacturers recommendations and planned maintenance procedures to minimise breakdowns. Replacement plant, such as the 360 excavator will be available within 24-48 hours. Specialist equipment such as loaders or screening equipment are rarely deemed critical and will be replaced as soon as practicably possible.

6.2.6 Runoff from the treatment areas will be collected within a sealed drainage system which drains to the onsite enclosed collection tanks and is not directly discharged to the surrounding environment.

Biofilter Malfunction

6.2.7 Malfunction of the biofilter could result in potentially odorous emissions from the treatment process by allowing contaminated air to be released directly into the atmosphere.

Control Measure

6.2.8 In the event of a biofilter malfunction, remedial measures will be implemented immediately upon an odour being noted. The most likely cause of any increasing odour from the biofilter would be low moisture levels within the media, this can be corrected quickly via switching on the irrigation system.

6.2.9 If the source of odour is the presence of fissures within the matrix, effectively 'short circuiting' the biofilter media, then the biofilter can be immediately de-compacted/turned with on-site excavation plant and additional oversize compost added. Quick release nutrients would also be added during this operation to provide added reassurance that nutrient levels are not deficient.

6.2.10 To avoid malfunction, a regular inspection and service regime is always implemented to ensure the biofilter is operating effectively. Continuous monitoring ensures any odours from the biofilter are identified immediately and remediated promptly. There has never been a failure of the biofilter on the Applicants other site.

Acceptance of Malodourous Waste

6.2.11 Acceptance of a malodourous waste to the STF could result in the addition of inappropriate material to the biopiles, potentially resulting in odour complaints.

Control Measure

6.2.12 The reception of malodorous waste is avoided as far as practicable during pre-acceptance checks of soil analysis data, site visits to inspect soil stockpiles at the producer's sites etc to check for odour potential. However, even with these checks there is always the remote possibility of occasional loads having a detectable odour at the point of waste deposit.

6.2.13 In the event that a malodourous waste is deposited at the site, the waste will be identified at the point of reception. In the event that the odours cannot be mitigated, then the load will be immediately removed from site in accordance with the site's waste rejection procedure. The site manager will be notified of the occurrence and the source of the waste identified prior to formal notification to the EA of a material rejection.

6.2.14 Where soils with odours are deemed to be suitable for acceptance and odours can be easily mitigated then the following will be implemented in order of effectiveness:

1. Covering of load with a very thin layer of woodchip stored on site for treatment operations – this has been shown to be very effective in immediately mitigating odours. This has the advantage that woodchip addition is implemented as standard during treatment commencement.
2. Covering with non-odorous soil from a treatment batch currently being treated on site. This is effective but requires a source of non-odorous soil in close proximity to the odorous waste deposit.
3. Cover with a tarpaulin; whilst this is effective, it does have a number of potential health and safety implications and can be of limited use over larger stockpiles or during high winds where covering may not be possible or result in partial uncovering of a stockpile

6.2.15 Soils will then be placed on a biopile extraction pipe or treated by screening/hand picking as soon as the formal reception procedure has been completed.

Adverse Weather

6.2.16 Periods of adverse weather conditions including high rainfall leading to flooding, low / high temperatures, temperature inversions and high winds in the direction of sensitive receptors.

Control Measure

6.2.17 Following adverse weather conditions such as continued and persistent high winds towards the sensitive receptors operations can resume (screening and biopile movement) as soon as possible when favourable conditions are present. However, there is the remote possibility that operations will occasionally have to be undertaken during adverse weather conditions in order to minimise potential for increased impacts at a later date.

Process Failure

6.2.18 Breakdown of the process and failure to maintain optimum conditions resulting in anaerobic conditions developing within the biopiles, process material and/or final product. This could result from prolonged storage times, inadequate aeration, unsuitable waste material or final product not fully treated.

Control Measure

6.2.19 The use of experienced and competent staff and an ISO accredited set of formal procedures has meant that there has never been the possibility of a process failure incident at the Applicants other site. Any short term/replacement staff used on occasions will find it easy to implement effective control due to the use of a standard set of procedures that form the operations manual for the site. This is regularly audited and is accredited to ISO 9001, 14001 and 18001. COTC cover is continuous at the site.

6.3 Force Majeure and Odour

6.3.1 Unexpected circumstances such as a fire or explosion on site or an act of vandalism could trigger the release of discernible odours. Under these circumstances' odour related contingency measures will be covered as per this Odour Management Plan and will be dealt with as promptly as possible. Remediation and reporting procedures for the above are as required within the Permit.

6.4 Drainage

6.4.1 All surface waters which falls on the external waste piles will be collected by the sealed drainage system and pumped to the on-site holding tanks. The tanks are emptied, and waters disposed off at a suitable facility.

6.4.2 There are no direct releases of water off site. All drainage infrastructures will be inspected, maintained and repaired as necessary. The holding tanks provides an enclosed system which reduced the impact and release of odours from process and surface waters.

6.4.3 In all circumstances, regular housekeeping will be undertaken to minimise the spread of odorous residues. All site staff will be trained to identify any malodours from operations on site and conversant with odour control and management procedures.

6.5 Risk Assessments

6.5.1 An Amenity & Accidents Risk Assessment (ARA)is included with the permit variation under doc ref: 3982-CAU-XX-XX-RP-V-0303. The ARA details the risks to receptors and the management control and mitigation procedures in place to minimise the impact of hazards/emissions.

6.5.2 An Air Quality Impact Assessment for the proposed facility has been prepared by Airshed, the scope of the assessment was to consider the potential air quality impact on human health from the emissions of VOCs. It also considered that odour impacts from the proposed site activities are predicted to be negligible. A copy of the Air Quality Impact Assessment (AQIM) report has been included under Appendix 2 'AS 0732 Daneshill Soil Vapour Facility'.

6.5.3 A Flood Risk Assessment and Drainage Strategy (FRA) has been required in support of planning application for the STF under document ref: 3982-CAU-XX-XX-RP-V-0300. The FRA provides a site-specific flood risk assessment demonstration that the proposed development will be safe for its lifetime and taking into account the vulnerability of users without increasing flood risk elsewhere.

7 ENGAGING WITH THE NEIGHBOURS

7.1 Complaints Procedure

7.1.1 Typically, complaints about the site are usually received via the Environment Agency, although FCC Recycling (UK) also deal with complaints received directly where necessary. In the event of a complaint being received the following can be implemented:

- Information can be provided to the local neighbours (via the Environment Agency) regarding the point and method of contact for the Facility in the event an odour has been detected or they want to discuss any activities etc at the Facility.
- The neighbours can be advised that any complaints / concerns will be addressed immediately following identification/notification and contingency action implemented.
- The neighbours can be advised of any corrective action and a follow up call carried out if required.

7.1.2 The Operator will continue to maintain a routine liaison with the Environment Agency regarding odour nuisance. In the event of odour complaint being received by the EA the complaint is passed to the Operator for the investigation. Every complaint will be recorded on Operators system as below:

- All complaints are recorded by the site manager or site staff on the FCC 'Safeguard' online incident recording system, describing the complaint and severity
- Where this is not practicable; an odour complaint form will be completed, and cross referenced to the validation report & complaints log (As per the Sites Management System)
- The complaint can be forwarded to the Regional Environment Manager to undertake further investigation
- Depending on the severity, the complaint can be escalated to senior management for investigation if necessary
- The system is a digitalised process and records a wide range of reporting

7.1.3 The odour investigation procedure will also include the following elements:

- Site walk-over coupled with olfactory monitoring along the site boundary assessment of the site operations which took place prior to and at the time of the complaint in relation to their odour potential and other on-site sources of odours;
- Monitoring will be carried out walking around the operational perimeter;
- Assessment of the weather conditions prior to and at the time of the complaint.
- A suitably trained person who is familiar with the site conditions and the 'sniff-testing' monitoring technique will carry out odour investigations at the site. In the event of a substantiated complaint being received, then mitigation measures will be used for the areas/activities which were cause of the particular odour event (Section 6.3)

7.1.4 A follow up report on the investigation will be issued to the EA if the complaint is found to be substantiated and if requested, to the Local Authority. The report will identify improvements proposed to reduce the potential for future complaints. Any new recommendations will then be incorporated in the Odour Management Plan and the operating procedures.

8 MONITORING

8.1 Schedule

8.1.1 Odour monitoring will be undertaken in order to assess how successful the operational management and mitigating control measures are at the STF and to identify if necessary whether odour is causing a potential nuisance to ensure that appropriate remediation measures are adopted early. Olfactory Odour monitoring will be coupled with a site walk-over along the site boundary assessment of the site operational activities.

8.1.2 Monitoring will be undertaken by designated staff that will be fully trained by Site management. All site personnel will be responsible for reporting any problem odours identified during their day to day operations.

8.1.3 Details of monitoring thresholds, limits and frequencies are included in the Emissions Management Plan within Document ref: 3982-CAU-XX-XX-RP-V-0307. Monitoring at the Facility will consist of the following;:

Parameter	Monitoring Technique	Frequency
Meteorological Monitoring	Local weather information	Manually checked at start of each working day and logged
Olfactory Monitoring	STF perimeter. Off Site checks (towards the identified sensitive receptors in event of odours from the STF detected at boundary or following a complaint	Daily (or more frequently following odour complaints)
Biofilter Monitoring	VOCs (including BTEX) Speciated PAHs TPH Photo ionization detector (PID)	Monthly Bi-monthly
Complaints Monitoring	Logged in accordance with Complaints procedure	Ad-Hoc

8.2 Meteorological Monitoring

8.2.1 The nearest weather station will be utilised for meteorological monitoring at the STF and will as a minimum include monitoring for wind speed, direction, precipitation, rainfall, temperature etc.

8.2.2 Weather conditions will be noted at a time of an odour survey and assessed in terms of any odour effects beyond the site boundary. This would indicate which local receptors lie downwind of the site. The following weather conditions are considered to be unfavourable with regard to the effects of the potential odour emissions and should be considered when assessing odour events:

- Weather conditions, especially wind speed and direction, are important factors which influence odour dispersion. Stronger winds (>6m/s) reduce the impact of odours due to greater dilution and dispersion than lighter winds, whereas wind direction determines the direction of odour dispersion.
- The greatest risk of poor odour dispersion tends to occur on cool nights, with low wind speed, during anti-cyclonal conditions and in the presence of a temperature inversion. These conditions often happen during the cold part of the year and can result in odours being transported over long distances from the source.
- Calm weather spells (wind speed <0.1m/s) results in omni-directional dispersion of odours from the site as it is regulated largely by diffusion in the air. Under such conditions, all locations directly adjacent to the source would be expected to be impacted by fugitive emissions.

8.2.3 In the event of odour complaints, the data enables complaints to be assessed against the meteorological conditions for the relevant period. Meteorological information will be recorded on the Safeguard system which is logged internally and sent to the EA.

8.3 Olfactory Monitoring

8.3.1 As part of the daily inspections, appropriately trained and experienced Site personnel will carry out olfactory monitoring off site around the site activity perimeter boundary. Additional locations for monitoring may also be included, depending on the frequency and location of any complaints received at the Facility (i.e. olfactory monitoring outside of the permit boundary at sensitive receptor locations).

8.3.2 The monitoring results will be recorded on the Site Daily Inspection Sheet, which forms part of the Site's Management System.

8.3.3 Olfactory monitoring will be carried out in accordance with the recommendations detailed in the EA H4 guidance, including avoiding strong foods or drinks and strongly scented deodorisers or toiletries etc for at least half an hour prior to the monitoring. In addition, individuals suffering from a cold, sore throat or sinus problems that may impair their ability to detect odours will not be used.

8.3.4 The designated person will exit their vehicle and remain in the locality for a minimum of 1 minute whilst breathing normally. Any external activities that may contribute to odour generation in the surrounding area will also be noted on the form and an assessment of the intensity of the odour will be made using the key provided. The routine monitoring points have already been assessed for sensitivity, but should any additional locations be used the sensitivity will be entered using the key provided.

8.3.5 In the event odour is detected above intensity ranking 3 (moderate odour), the Facility management will be informed immediately, and the approximate location and extent of the odour plume assessed, and site operations reviewed and remediated.

8.4 Complaints Monitoring

8.4.1 Any complaints received directly by the operator or via the Regulatory bodies, including the EA and Local Authority, will be recorded on the operator's system. Investigation will then be undertaken via olfactory monitoring at the location of the complaint and on site to substantiate the extent and location of the plume and the source of the odour will be identified.

8.4.2 If necessary, monitoring will also be carried out at the nearest sensitive receptors to the Facility and the monitoring results recorded.

9 REMEDIAL ACTION PLAN

9.1.1 Following receipt of a complaint or identification of an odour at the Facility, the following action plan will be undertaken, including:

- Implementation of the mitigation measures as detailed in Section 6.2.
- Olfactory monitoring to assess the effectiveness of the mitigation measures employed.
- Additional olfactory monitoring as detailed above to identify the extent of the odour plume and potential cause for the odour i.e. waste material and / or process activity.
- Examination of the operational activities at the Facility at the time of the odour complaint or odour identification
- Examination of the meteorological conditions at the time of the complaint or odour identification
- Examination of the process conditions i.e. temperature and moisture content of the process piles, length of storage etc.
- Carry out a review of the operational procedure and process controls and instigate any control measures immediately following identification of the problem.

9.1.2 Further olfactory monitoring will be carried out to ensure the issue has been addressed and to monitor the effectiveness of any control measures undertaken.

9.2 Record Keeping and Reporting

9.2.1 The procedure for recording will be undertaken as detailed above. All information is recorded digitally and maintained within a digital database. All information can be accessed via a computer within the Site office and will be made available to the Environment Agency on request. This record keeping already forms part of the Management System.

9.3 OMP Review

9.3.1 This OMP will be reviewed on a regular basis or following receipt of a significant substantiated complaint that requires a change in management procedures for the STF.

Drawings

3982-CAU-XX-XX-DR-V-1800	500m Receptors Plan
3982-CAU-XX-XX-DR-V-1801	Site Location Plan
3982-CAU-XX-XX-DR-V-1804	Daneshill Landfill Site and Soil Treatment Facility
3982-CAU-XX-XX-DR-V-1806	Cross Sections Drawing
3982-CAU-XX-XX-DR-V-1807	Treatment Pads 1, 2, and 3 Site Layout Plan
3982-CAU-XX-XX-DR-V-1808	Surface and Foul Water Locations

LEGEND

- AREA OF PROPOSED ACTIVITY
- 1000m OFFSET BOUNDARY
- MAJOR ROAD
- MINOR ROAD
- RAIL
- SURFACE WATER
- PUBLIC AREAS
- AGRICULTURAL
- COMMERCIAL
- INDUSTRIAL
- RESIDENTIAL
- EDUCATION
- SSSI

REV					
P02	RECEPTOR BOUNDARY INCREASED	EJD	KB	AS	25.11.20
P01	ISSUED FOR INFORMATION	EJD	KB	AS	10.12.19
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION
STATUS: S2

CLIENT: FCC Environment

PROJECT:
DANESHILL
SOILS TREATMENT
FACILITY

TITLE:
1000m SENSITIVE
RECEPTOR
PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
KB	EJD	KB	KB

DATE	SCALE @ A1	JOB REF:	REVISION
04.11.2019	1:2500	3982	P02

DRAWING NUMBER
3982-CAU-XX-XX-DR-1800

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NOTE

AREA OF PROPOSED ACTIVITY

REV	MODIFICATIONS	BY	RE	AP	DATE
P2	ISSUED FOR INFORMATION	EJD	KB	AS	10.12.19
P1	ISSUED	KB	KB	KB	14.11.19

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: FCC Environment

PROJECT:
DANESHILL
SOILS TREATMENT
FACILITY

TITLE:
SITE
LOCATION
PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
KB	KB	KB	KB

DATE	SCALE @ A1	JOB REF:	REVISION
14.11.2019	1:10000	3982	P2

DRAWING NUMBER
3982-CAU-XX-XX-DR-1801

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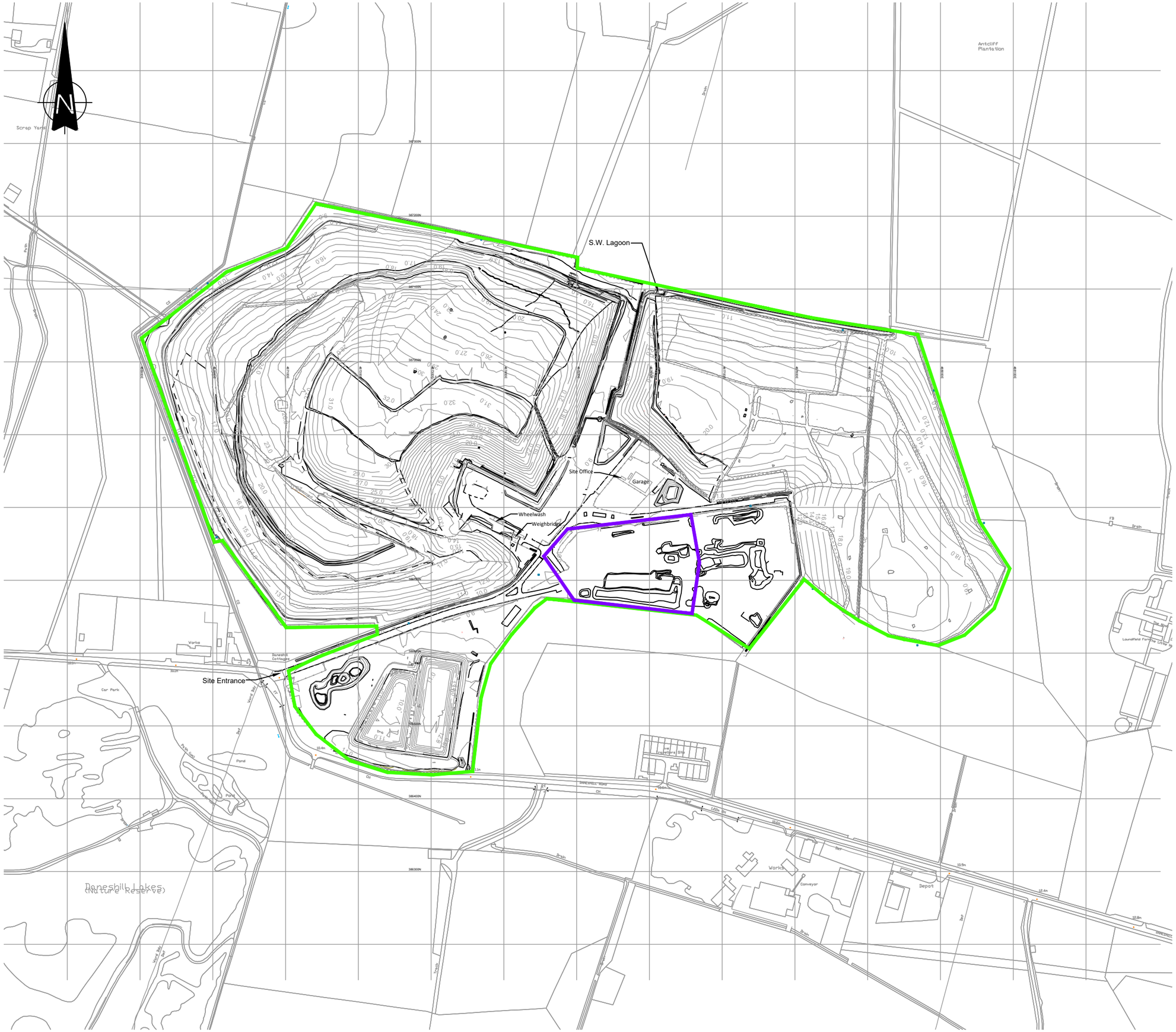

NOTE

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2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

LEGEND

- PERMIT BOUNDARY
- AREA OF PROPOSED ACTIVITY

REV					
P1	ISSUED FOR INFORMATION	EJD	KB	AS	03.02.20
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: FCC Environment

PROJECT:

DANESHILL
SOILS TREATMENT
FACILITY

TITLE:

SITE BOUNDARY PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
KB	EJD	KB	KB
DATE	**SCALE @ A3**	**JOB REF:**	**REVISION**
17.12.2019	1:5000	3982	P1

DRAWING NUMBER: 3982-CAU-XX-XX-DR-V-1804

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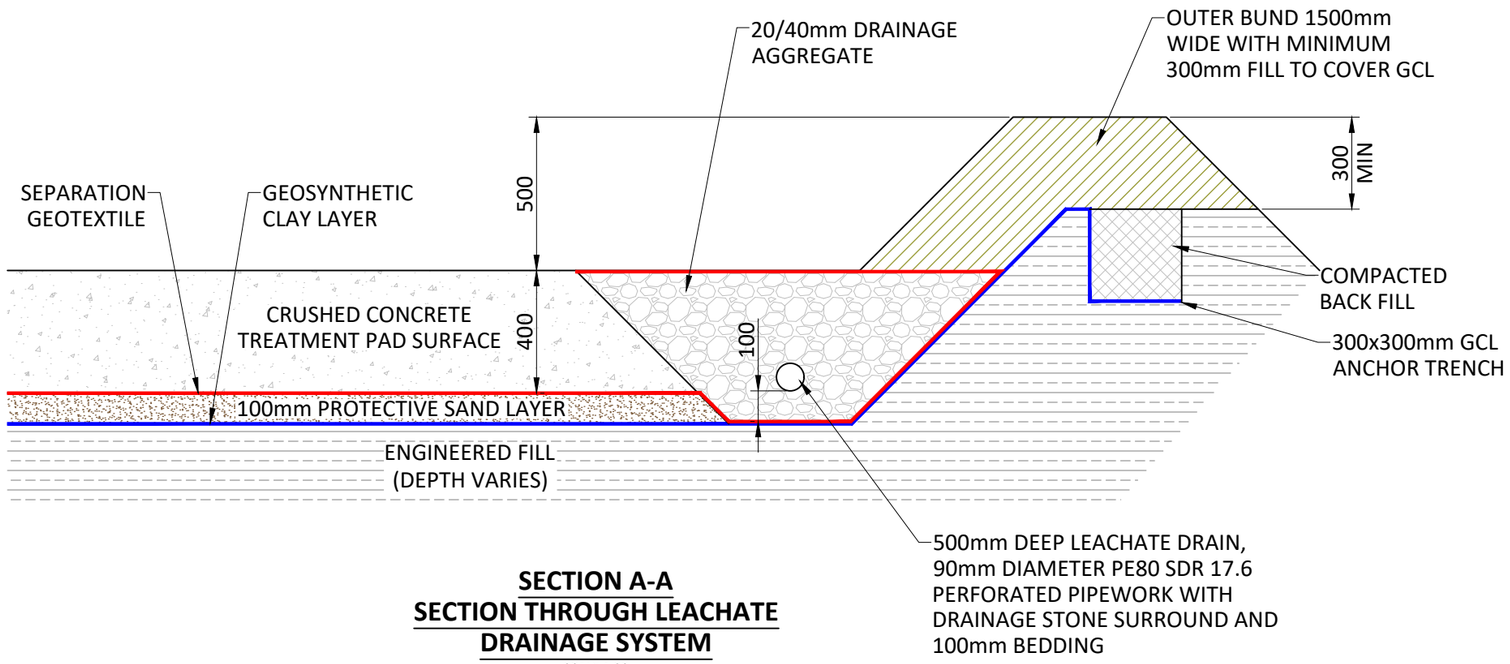
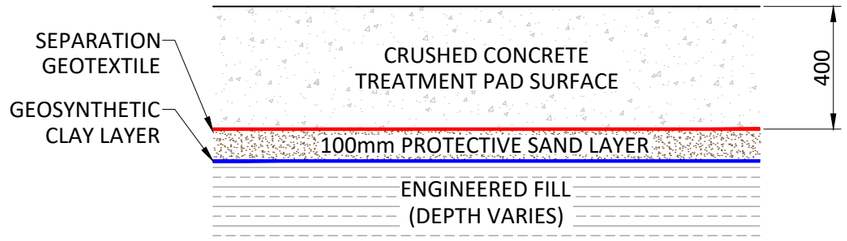
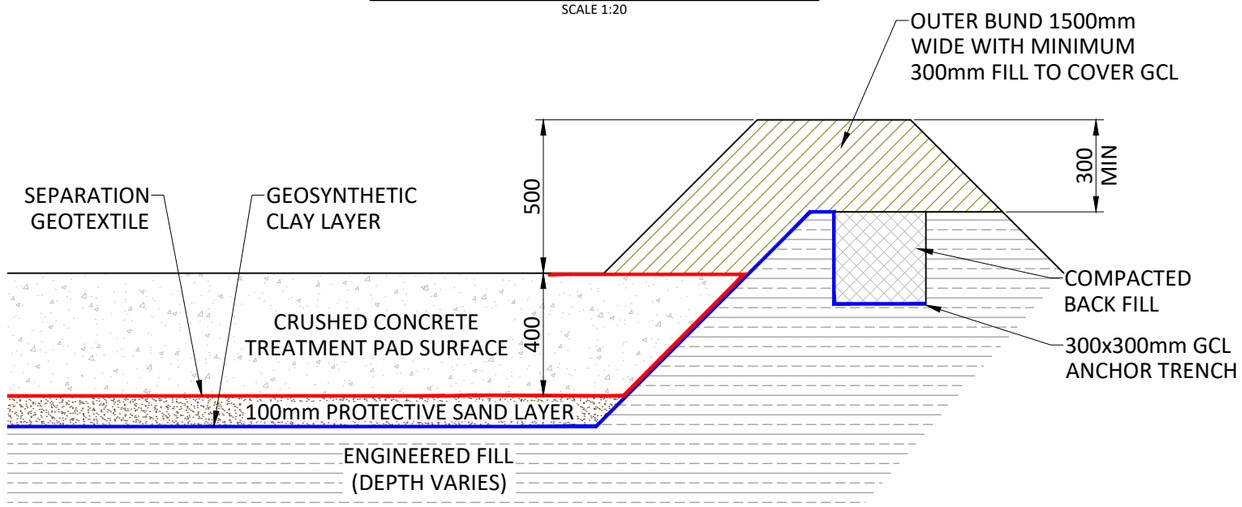
3. SECTIONS POSITIONS SHOWN ON DRAWING 3982-CAU-XX-XX-DR-C-1805



SECTION A-A
SECTION THROUGH LEACHATE DRAINAGE SYSTEM
SCALE 1:20



SECTION B-B
SECTION THROUGH TREATMENT PAD
SCALE 1:20



SECTION C-C
SECTION THROUGH TREATMENT PAD & EDGE BUND
SCALE 1:20

REV					
P1	ISSUED FOR INFORMATION	EJD	AS	AS	06.02.20
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION
STATUS: S2

CLIENT: FCC Environment

PROJECT: DANESHILL SOILS TREATMENT FACILITY

TITLE: SECTIONS DRAWING

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
JC	EJD	JC	JC

DATE	SCALE @ A3	JOB REF:	REVISION
05.02.2020	AS SHOWN	3982	P1

DRAWING NUMBER: 3982-CAU-XX-XX-DR-C-1806

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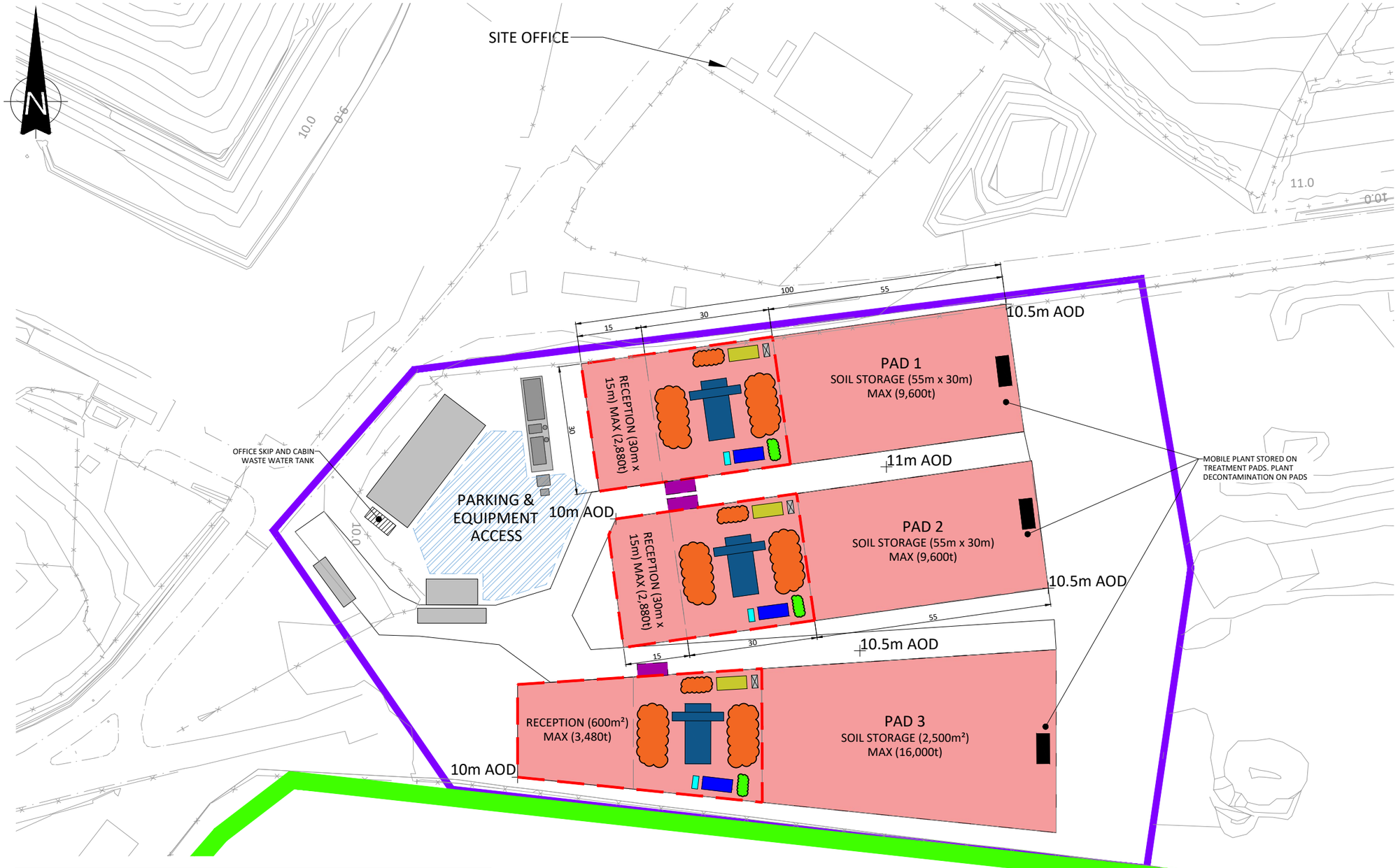

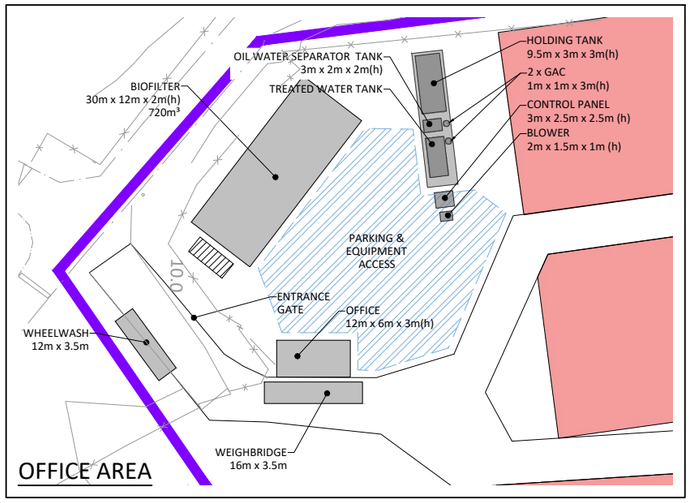

NOTES

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3. DESIGN BASED ON PROVECTUS DRAWING - DANESHILL 1

LEGEND

- AREA OF PROPOSED ACTIVITY
- ASBESTOS CONTROLLED WORKING AREA
- PICKING AREA
- ASBESTOS SKIP
- DECONTAMINATION AREA
- INTEGRALLY BUNDED FUEL CUBE FOR PLANT USE
- WASTE SKIPS - SOIL DERIVED REFUSE
- 600kg BAGS OF AMMONIUM NITRATE IN WATERPROOF PACKAGING
- 30m³ WOOD CHIP
- FINES, OVERSIZE AND MID RANGE FRACTIONS
- SOIL SCREENER

P04	AMENDED TO ENGINEERS COMMENTS	EJD	KB	KB	26.10.21
P03	AMENDED TO ENGINEERS COMMENTS	EJD	KB	KB	04.10.21
P02	WHEEL WASH POSITION AMENDED	EJD	KB	KB	01.10.21
P01	ISSUED FOR INFORMATION	EJD	KB	KB	30.09.21
REV	MODIFICATIONS	BY	RE	AP	DATE

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: FCC Environment

PROJECT:
DANESHILL
SOILS TREATMENT
FACILITY

TITLE:
SOILS TREATMENT
PADS 1 / 2 / 3
SITE LAYOUT PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
KB	EJD	KB	KB

DATE	SCALE @ A3	JOB REF:	REVISION
29.09.2021	1:1000	3982	P04

DRAWING NUMBER
3982-CAU-XX-XX-DR-V-1807

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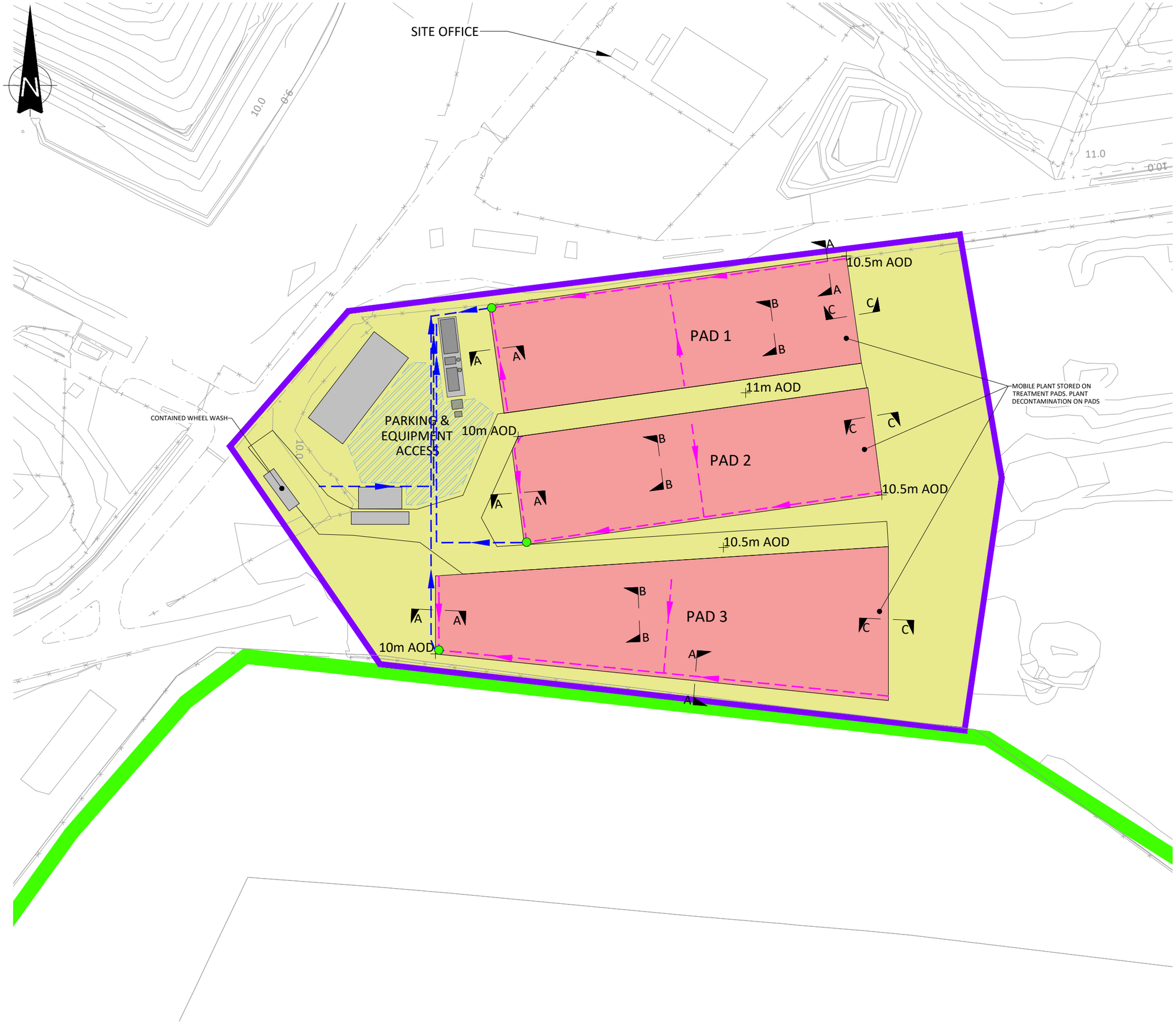

NOTES

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3. DESIGN BASED ON PROVECTUS DRAWING - DANESHILL 1

4. SECTIONS SHOWN ON DRAWING 3982-CAU-XX-XX-DR-C-1806

LEGEND

- AREA OF PROPOSED ACTIVITY
- LEACHATE & DRAINAGE FLOW DIRECTION
- CONNECTION BETWEEN PUMPING CHAMBER AND WATER TREATMENT SYSTEM
- WATER COLLECTION & PUMPING CHAMBER
- NON-CONTAMINATED SURFACE WATER FALLING TO EXISTING SURFACE WATER ARRANGEMENTS

REV	MODIFICATIONS	BY	RE	AP	DATE
P02	UPDATED TO ENGINEERS COMMENTS	EJD	KB	KB	26.10.21
P01	ISSUED FOR INFORMATION	EJD	KB	KB	30.09.21

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: FCC Environment

PROJECT:
DANESHILL
SOILS TREATMENT
FACILITY

TITLE:
SURFACE AND FOUL
WATER LOCATIONS

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
KB	EJD	KB	KB

DATE	SCALE @ A3	JOB REF:	REVISION
29.09.2021	1:1000	3982	P02

DRAWING NUMBER
3982-CAU-XX-XX-DR-V-1808

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Appendix 1

STF – FO02 - SOIL RECEPTION PROCEDURE

Document No:	STF - RR - FO02	**Issue No:**	2
Author:	Jon Owens	**Approved By:**	Steve Langford
Issue Date:	19/01/18	**Approval Date:**	19/01/18

Introduction

This procedure relates to the measures to be undertaken for the assessment of data and inspection of waste received at the soil treatment facility. It allows rejection of non-conforming waste to ensure no contaminated soils are accepted which cannot be treated by the treatment facility to a standard suitable for reuse, or which breach the list of permitted wastes as shown in the site's Environmental permit.

Principle of Operation

The inspection will allow the following to be assessed prior to acceptance:

1. Presence of untreatable and hazardous materials (e.g. tars, clinker, asbestos insulation etc.) in the contaminated soil.
2. Presence of excessive litter/debris in the contaminated soil.
3. Compliance with the previously supplied chemical/physical analysis information (supplied by waste producer).
4. Potential for the waste to behave as a liquid or have free water/oil in the waste

If the waste material is not compliant with the agreed conditions of the Environmental Permit and pre-acceptance assessment then the waste will be declined/rejected. As a note, the forms of untreatable asbestos described in point 1 are predominantly insulation products as follows in Table 1.

Table 1. Unacceptable Forms of Asbestos Insulation Products

Form of asbestos	Example
Asbestos pipe lagging	
Loose asbestos fill	
Asbestos insulation board (AIB)	

Procedure

Pre-Acceptance Assessment

This is undertaken by Provectus to confirm treatability to meet the reuse criteria. A set of Terms and Conditions for acceptance are sent to the Waste Producer including a clear statememt of any waste characterisation samples that are deemed untreatable. These are agreed in writing between the Waste Producer and Provectus prior to an authorisation number (contract line) being issued by FCC at the weighbridge for deposit at the Soil Treatment Facility.

Where data gaps exist or queries remain about the suitability of material for treatment, Provectus or FCC will offer to attend the site of origin to undertake pre-acceptance analysis and visually inspect the material and obtain further information about the waste description.

In the event that the moisture content of the waste being in the range of 25-30% then the potential for free water or oil will be further reviewed. Where moisture contents are at this level or even higher and the material does not behave as a liquid, have the potential for releasing water/oil etc and is suitable for the site infrastructure then it would be accepted on a case by case basis.

Should either Provectus, or after consultation, FCC determine that there is the high potential for material to contain untreatable inclusions or to behave as a liquid or contain free water or oil then the waste will be declined for acceptance.

Duty of Care Documentation

Duty of Care Documentation and other legal procedures (registration of hazardous waste site *etc*.) are completed between the Waste Producer and forwarded to FCC. No tipping on the STF will be permitted without relevant documentation from the waste producer. This must be checked on-site at the STF to ensure that the load is indeed destined for the STF, and that the documents are correctly completed. In the case of hazardous waste, the consignment note shall be filled in by a member of Provectus staff; and in the case of non-hazardous waste, the waste transfer note shall be inspected at the STF site office, and the load checked by a Provectus staff member at the STF.

Health and Safety

The site technician or PM is to provide guidance to the location for soil to be tipped, and any relevant safety information prior to tipping of soil.

Technicians and site personnel are to stand well away from the lorry when tipping so as to avoid any crush injuries/incidents as a result of being in close proximity to the tipping lorry. Any drivers must be informed of the requirement to wear a hard hat and high visibility vest when outside of the lorry cabin.

Lorries shall be informed to check that any waste/debris is removed from their lorry prior to leaving the STF.

Visual Inspection: Waste Input

The following locations will be used for accepting wastes:

- Hydrocarbons only: biopile treatment area
- Asbestos only, or asbestos and hydrocarbons: asbestos processing shed

The following plant and personnel are required as part of this procedure:

- Provectus STF Technician
- Excavator / loading shovel (if available)

Each load of soil for inspection will be tipped onto the nominated quarantine area by the tipper lorry. The technician will inform the tipper lorry driver to remain at the stockpiling area until the inspection has been completed.

In the event of the material containing free water or oil, the load will be immediately rejected.

In the event of untreatable forms of asbestos being present, the load will be immediately rejected

The excavator will be used to expose any unsuitable materials and allow a comprehensive visual assessment. The technician will determine the next action when this has been completed, this will comprise of the following:

- Waste is accepted and tipper lorry is permitted to leave the STF with the accompanying paperwork, or;
- Waste is not accepted and the unsuitable element of waste load, either partial or complete load is removed by excavator and placed back into the tipper lorry. A rejection form is filled in on-site and both Landfill Manager (LM) and Sales Manager (SM) are informed. It is the duty of FCC to inform the Environment Agency of any rejected loads.

At the end of the formal waste acceptance procedure the soil will be prepared for processing or biotreatment. Coordination of further treatment/processing events is to be decided by the Site Manager/Site Operator.

Chemical Analysis: Waste Input

Based on visual inspection, sampling frequency will be considered; this is in relation to the volume from each hazardous waste production site. Sampling will be undertaken on soils using composite sampling methods described in BS812.

The chemical analysis of soils generally takes 5-7 days to complete, therefrore limited storage times are required. Materials will be placed into treatment as soon as practicable from the receipt of chemical analysis and formal acceptance of the waste.

The range of contaminants for analysis will be based upon the original contaminating substances. A copy of the analysis shall be checked by the PM for verification against the original client data. In the event of non-conformity, the PM shall liaise with the LM and SM, and a decision on the next course of action will be taken.

For avoidance of doubt, the limits for asbestos from laboratory testing will be as follows:

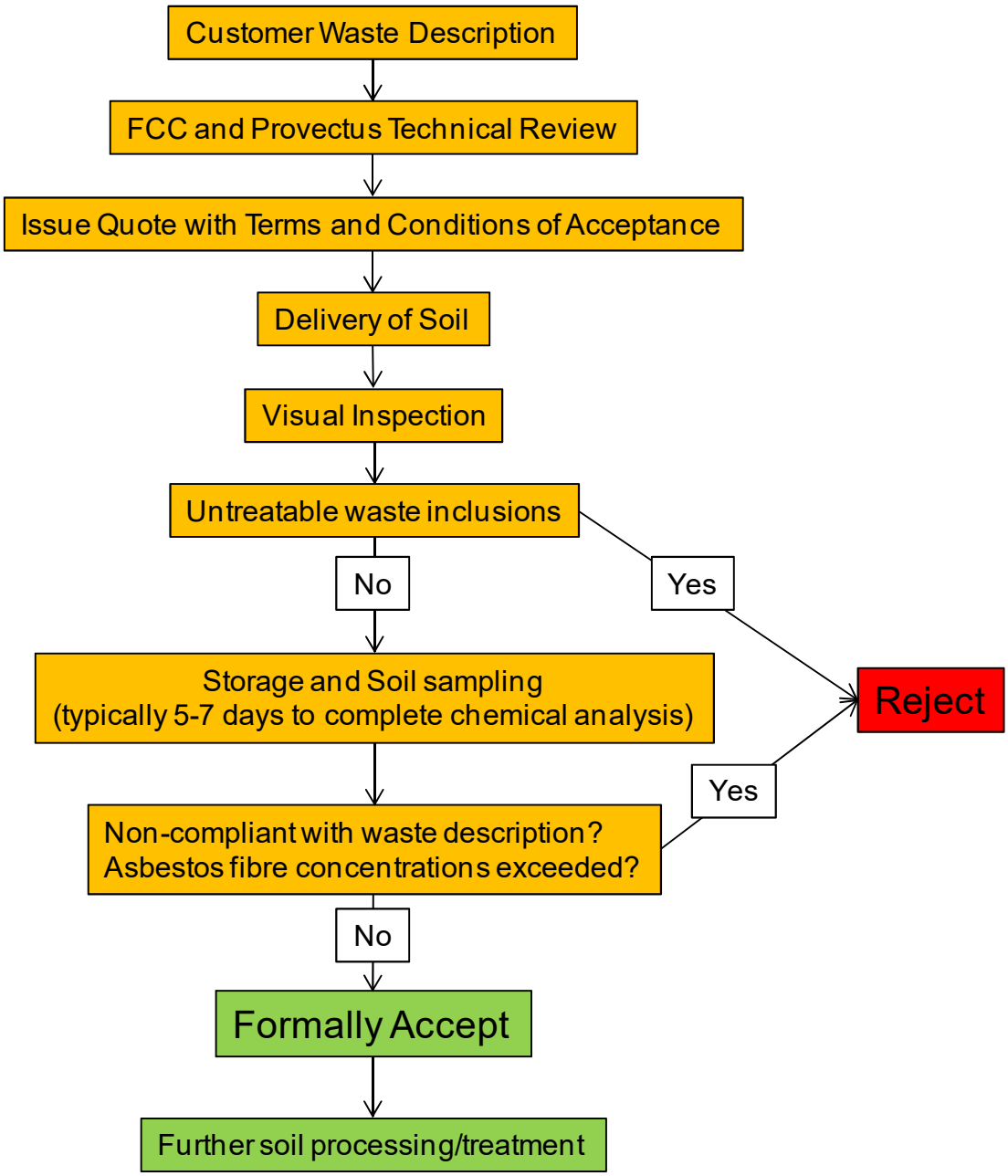
- Chrysotile only: 0.1%
- Other forms of asbestos (or chrysotile and others): 0.01%
- Asbestos debris limited to those which can be removed as Notifiable Non-Licensed Works (NNLW)

The waste will only be formally accepted once initial reception analyses is received in accordance with procedure STF PR02.

Summary of Waste Reception

Figure 1 is a flow diagram for the waste reception procedure. The procedure is implemented to ensure that the waste is only formally accepted once visual inspections and chemical analysis of received wastes has been successfully completed. This ensures that any soils that are formally accepted are suitable for further soil processing/treatment. All non-compliant wastes will be rejected.

Figure 1. Summary of Waste Acceptance Procedure



Appendix 2

The Airshed

Air Quality, Odour and Environmental Noise

Air Quality Impact Assessment
Proposed Soil Treatment Facility
at Daneshill Landfill
Lound Retford

Prepared by
The Airshed, 5 Lauder Place, East Linton
East Lothian EH40 3DB
Tel. 01620 860 529
mail@theairshed.com
www.theairshed.com
Registered in Scotland
Company No. SC309129

Record of changes

Version	Date	Change
1	18th December 2019	1st draft for internal review
2	8th January 2020	For client review
3	13th January 2020	Further and clarification of project description
4	2nd March 2020	Change to report title

Executive Summary

FCC Recycling (UK) propose to operate a new soil remediation facility on land at Daneshill Road, Lound, Retford DN22 8RB. The proposed facility is located in a rural area adjacent to a former landfill and current waste treatment facilities. The nearest established residential areas are Ranskill to the northwest, Torworth to the west and Lound to the east. There are isolated houses within 1km of the proposed facility, including the Travellers site at Daneshill Road.

The proposed bioremediation process will utilise industry standard bio-pile technology and will operate through the use of bio-piles and moisture control with extracted air treated in a bio-filter before being released to the atmosphere.

Caulmert Ltd, Environmental Consultants, has appointed The Airshed to conduct an air quality impact assessment (AQIA). The scope of this assessment is to consider the potential air quality impacts on human health from the emissions of VOCs. Dust impacts associated with the proposed facility are considered elsewhere.

The nearest sensitive receptors where long-term exposure is relevant is at the Travellers' site on Daneshill Road, ~280m to the south-east.

The airborne concentrations of pollutants have been predicted using ADMS 5.2, a widely used atmospheric dispersion model, using five years of hourly sequential meteorological data from RAF Scampton. The assessment considers the effects of these emissions on sensitive receptors in terms of Environmental Assessment Levels (EALs) for assessing human exposure. A single Scenario has been assessed:

- Scenario 1 considers emissions from the bio-filter assuming the maximum measured concentrations of VOCs reported at a similar site elsewhere.

The predicted concentrations of Benzene, Toluene, Ethylbenzene and Xylene are 0.0% of the relevant long-term and short-term EALs at the nearest sensitive receptors. The predicted air quality impacts from the proposed facility are insignificant.

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Acronyms

AD	Anaerobic Digestion
ADMS 5	Air Dispersion Modelling System Version 5
AERMOD	Preferred dispersion model for USEPA
AOD	Above Ordnance Datum
AQIA	Air Quality Impact Assessment
AQMA	Air Quality Management Area
AQS	Air Quality Standards
As	Arsenic
BAT	Best Available Technique
C_6H_6	Benzene
$C_{20}H_{12}$	Benzo(a)pyrene
Cd	Cadmium
CERC	Cambridge Environmental Research Consultants
CLF	Critical Loads Function
CO	Carbon Monoxide
Co	Cobalt
CHP	Combined Heat and Power
Cr	Chromium
Cr_{VI}	hexavalent Chromium
Cu	Copper
^oC	Degrees Centigrade
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency for England
EAL	Environmental Assessment Level
EIA	Environmental Impact Assessment (a process)
EQS	Environmental Quality Standard
ES	Environmental Statement (a document or series of documents)
FGT	Flue Gas Treatment
g/s	grams per second
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
Hg	Mercury
HHRAP	Human Health Risk Assessment Protocol
IED	Industrial Emissions Directive
IPPC	Integrated Pollution Prevention & Control Directive
K	degrees Kelvin
kW	kiloWatt
LNR	Local Nature Reserve
m/s	metres per second
m^3/s	cubic metres per second
mg/m^3	milligrams per cubic metre(10^{-3})
Mn	Manganese
MSW	Municipal Solid Waste
ng/m^3	nanograms per cubic metre (10^{-9})
NH_3	Ammonia
Ni	Nickel
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
O_2	Oxygen
OS	Ordnance Survey
Pb	Lead
pg/m^3	pico gram per cubic metre (10^{-12})
PM_{10}	Particles with aerodynamic diameter less than 10 microns
$PM_{2.5}$	Particles with aerodynamic diameter less than 2.5 microns
PC	Process Contribution
PEC	Predicted Environmental Concentration
Sb	Antimony
Sn	Tin
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TEQ	Toxic Equivalent (usually for dioxins and furans)
TG(16)	Technical Guidance Note for Local Air Quality revised in 2018
Tl	Thallium
tpa	tonnes per annum
ug/m^3	micrograms per cubic metre (10^{-6})
U_{10}	wind speed at measurement height – usually 10m above local ground level
USEPA	Environment Protection Agency (for the United States of America)
V	Vanadium
VOCs	Volatile Organic Compounds
WwTP	Wastewater Treatment Plant
WID	Waste Incineration Directive
Zn	Zinc

Prediction is very difficult, especially about the future.
Niels Bohr, Danish physicist (1885 - 1962)

1.0 INTRODUCTION

Background to Report

1.1. FCC Recycling (UK) Ltd who are a wholly owned subsidiary of FCC Environment (UK) Ltd, propose to operate a new soil remediation facility on land at Daneshill Road, Lound, Retford DN22 8RB. The proposed facility is located in a rural area adjacent to a landfill and other waste treatment facilities. The proposed facility is located in a rural area where the nearest established residential areas are Ranskill to the northwest, Torworth to the west and Lound to the east. There are isolated houses within 1km of the proposed facility including the travellers site at Daneshill Road. The site location is shown in Figure 1.

1.2. The proposed bioremediation process will utilise industry standard bio-pile technology and will operate through the use of bio-piles and moisture control; addition of suitable nutrients to the soil and forced air extraction to encourage micro-organism growth leading to the breakdown of hydrocarbons into by products such as carbon dioxide and water vapour. Soils will typically be treated over an 8-16-week period, with the material being turned infrequently, typically once every 8 weeks. The bio-piles will be placed on water and air extraction pipes connected to a blower that will draw air through the soils. The extracted air is then passed through a bio-filter before being discharged to the atmosphere. Excess water draining through the soils will be collected and treated to remove any oils or suspended solids. Further details on the project description are presented in Appendix 1.

1.3. Caulmert Ltd, Environmental Consultants, has appointed The Airshed to conduct an air quality impact assessment (AQIA). The scope of this assessment is to consider the potential air quality impacts on human health from the emissions of VOCs. Dust impacts associated with the proposed facility are considered elsewhere.

Table 1.1 – Sensitive Receptors – Human Health (selected <2km)

No.	Location	OS x	OS y	Distance (m)
1	Travellers Site	467595	386491	279
2	Daneshill Cottage	467047	386590	474
3	House to east	468272	386638	788
4	Mattersey Road	468558	386067	1265
5	Lound	468895	386146	1528
6	Lound	469046	386531	1568
7	North View	469083	387159	1641
10	Mattersey Hill	468172	388578	1949
11	Lakeland House	467346	388611	1865
12	Mattersey Road	466777	388399	1797
14	Maltkiln Cottage	466239	387768	1614
15	Willow Avenue	466196	387589	1544
16	Lakeside Fishery	466351	387458	1344
17	Underwood Avenue	465818	387047	1701
18	Moat Farm	465851	386645	1645
19	Torworth Grange	465970	386001	1698
20	College Farm	466102	385473	1889

(N.B. distances are from the centre of the bio-filter)

1.4. The locations of the sensitive receptors considered in the study are shown in Figure 1 and receptor locations are presented in Table 1.1 above. The nearest receptor location is the Travellers' site 279m to the southeast of the proposed bio-filter.

Scope of Air Quality Impact Assessment

1.5. This assessment considers the potential adverse air quality impacts from the proposed facility on human receptors. The main pollutants of concern are Benzene, Toluene, Ethylbenzene and Xylene. This assessment is based on the assumption that the contaminants in the soils to be used at the facility will be similar in character to those tested at the Edwin Richards Quarry.

1.6. This study is intended to help determine the likely effects of the emissions on adjacent receptors. The dispersion model used in this study, ADMS 5.2, has been widely validated. Experience has shown that the model is conservative, so that it will tend to over-predict, provided the source estimates are accurate.

1.7. The assessment considers the effects of the emissions from the facility in terms of environmental assessment levels (EALs).

Report Structure

1.8. Section 2 discusses relevant air quality standards, and English and European Regulations and Guidance relating to air quality assessment criteria.

1.9. Section 3 describes the pollutant emission rates for the WwTP. The section also discusses the baseline air quality conditions around the installation, taking account of the character of the emissions.

1.10. Section 4 sets out the reasons for the approach to assessment and details the assumptions made in the dispersion model.

1.11. The results from the dispersion modelling are presented in Section 5.

1.12. Proposed mitigation measures are outlined in Section 6.

1.13. The significance of the residual emissions is presented in Section 7.

2.0 RELEVANT LEGISLATION AND STANDARDS

Introduction to Section 2

2.1. This section discusses relevant Guidance relating to the installation.

Environmental Assessment Levels

2.2. The Environment Agency (EA) has published Guidance[1] that proposes a simple screening approach where the predicted process contribution (PC) long-term concentrations of pollution may be regarded as insignificant where the PC <1% of the EAL. PC <10% of the EAL is insignificant for short-term concentrations. The relevant EALs for this assessment are set out in Table 2.1 below. Odour impacts are considered separately.

Table 2.1 – Environmental Assessment Levels (Human Exposure)

Pollutant	Long term	Short term
	ug/m³	ug/m³
Benzene	5	-
Toluene	1,910	8,000
Ethylbenzene	4,410	55,200
Xylene	4,410	66,200

N.B. columns are blank where there is no relevant EAL.

EA Guidance for Odour

2.3. The EA has issued Guidance on odour assessment[2] for processes that are subject to the Environmental Permitting Regulations (H4). The EA's odour criteria are based on the 98%ile of hourly averages in a typical year. This allows for atypical odour emissions or poor dispersion caused by unfavourable weather conditions around 175 hours over a year. According to this Guidance, odour from the most offensive odours, which is likely to include leachates, should be less than 1.5 OU_E/m^3 1 hour 98%ile at sensitive receptors. These criteria are quantified using dynamic olfactometry in accordance with British Standard, BS 13725:2003.

2.4. H4 advises that odours from different processes within the same installation are not necessarily equally offensive and that this should be taken into account. This assessment assumes that an odour benchmark of 1.5 OU_E/m^3 1 hour 98%ile will apply.

BS EN 13725 : 2003

2.5. The use of odour units, based on human response to odour rather than chemical speciation, presumes that human response to odour can be quantified scientifically. The European Standard for measurement of odour concentration, BS EN 13725 : 2003[3] specifies the sampling and analytical procedures for dynamic olfactometry and the quality assurance requirements for repeatability of results. Based on this type of sampling method, the limit of detection for 50% of the test panel is 1 OU_E/m^3. Odour units are not a measurement of concentration, but rather a ratio of

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions
[2] Environment Agency March 2011. H4 Odour Management. How to comply with your permit.
[3] BS EN 13725 : 2003. Air quality. Determination of odour concentration by dynamic olfactometry.

the number of dilutions required to reduce an odour to where it cannot be detected by 50% of the odour test panel.

Where Should EALs and Odour Benchmarks Apply?

2.6. Air quality standards should apply to all locations where members of the public may be reasonably likely to be exposed to air pollution for the duration of the relevant objective. Thus short-term standards intended to prevent exposure to toxic air pollutants with acute effects should apply to footpaths at site boundaries and other areas which may be frequented by the public even for a short period of time.

2.7. Longer term exposure and odour benchmarks should only apply at houses and gardens or other locations which the public can be expected to occupy on a continuous basis.

2.8. The receptors used in the modelling assessment are shown in Figure 1. The predicted impacts at these receptor locations are concerned with air quality impacts on human health and amenity.

2.9. This assessment assumes that odour benchmarks around the proposed installation should only apply to residential areas, or other locations which members of the public are likely to occupy over an extended period of time; and that pedestrians on footpaths and people on roads adjacent to the site are not sensitive to odour. All dwellings are considered to be highly sensitive receptors as defined by the IAQM 2014 Odour Guidance[4].

Assessment Framework

2.6. The assessment framework used to assess the significance of air quality impacts is set out in Table 2.2 below. This is based on DEFRA/EA Guidance[5] and the EA's informal pragmatic risk assessment method. These assessment criteria only apply to EALs and do not apply to the assessment of odour.

Table 2.2 - Air Quality Impact Assessment Criteria (Annual Mean at Receptors)

Predicted Impact	Adverse Significance	Justification
Greater than air quality limit value or objective	Major	Exceeding any air quality limit value would be unacceptable in terms of human health, or where the impact would have significant adverse ecological impacts.
Process Contribution >30% of EAL	Moderate	Risk based approach advocated by Environment Agency taking account of model headroom and uncertainty.
Process Contribution <30% of EAL	Minor/Moderate	Risk based approach advocated by Environment Agency taking account of model headroom and uncertainty.
Process Contribution <10% of EAL	Minor	Based on rule of thumb (factor of 10)
Process Contribution <1% of EAL	Insignificant	This is the assessment criteria proposed by EA as a screening method which states that process contributions can be considered insignificant if the long-term process contribution is <1% of the long-term environmental standard.

[4] IAQM 2014. Guidance on the assessment of odour for planning.
[5] Air emissions risk assessment for your environmental permit https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions

3.0 BASELINE AIR QUALITY AND PROCESS EMISSION INVENTORY

Emission Inventory for the AQIA

3.1 The emission estimates for the soil treatment facility assumes that all emissions are released from the surface of the bio-filter and ignores any fugitive emissions from the stockpiles and screening and grading operations.

3.2 Details of the emission rate from the bio-filter are presented in Table 3.1 at the end of the text.

3.3 A single emission Scenario has been considered for the assessment:

- Scenario 1 is based on the maximum measured concentration from a similar installation elsewhere.

Baseline Air Quality

3.4 The only available baseline estimates for Benzene in the study area are from DEFRA modelled projections based on work conducted in 2001. This indicates that the annual mean exposure to Benzene in air within the study area was up to 0.275ug/m^3 for the year 2010.

4.0 DISPERSION MODELLING

Introduction to Section 4

4.1. This Section sets out the reasons for the approach to assessment and details the assumptions made in the dispersion modelling.

Justification for Approach

4.2. The likely impact from process emissions may be estimated using an appropriate atmospheric dispersion model and reliable emission estimates. The emissions from the process for Scenario 1 are based on worst-case emission concentrations measured at a similar facility elsewhere.

4.3. The objective of the dispersion modelling assessment is to predict the likely effect of the prevailing climate, local surface conditions and topography on plume behaviour; and to predict the likely worst case airborne concentrations at sensitive receptors around the facility.

4.4. The pattern of pollutant dispersion may be estimated using several years of historical meteorological data from a representative site. Air quality impacts are assessed against Environmental Assessment Levels.

4.5. The assessment ignores the impacts from fugitive emissions. This is contingent on appropriate measures being adopted at the site to prevent or minimise fugitive releases.

Approach to Modelling Uncertainty

4.6. Environment Agency policy statement[6] refers to the Royal Meteorological Society Guidelines on Dispersion Modelling. According to this Guidance, dispersion modelling studies should include a Sensitivity Analysis for model inputs to provide an estimate of the possible errors in the predictions. The Environment Agency has also published requirements for dispersion modelling.[7] This includes advice on the Agency's requirements for reporting. These Guidance documents have been taken into account in the assessment.

4.7. A widely recognised mathematical model (ADMS 5.2) has been used to predict how emissions will be dispersed taking account of: the source conditions (using emission factors and the flow rate and pollutant concentrations); release conditions (efflux velocity and temperature); meteorological conditions from a representative site (in this case near ground measurements at RAF Scmpton supplied by the Met Office); building effects and surface conditions (surface roughness).

4.8. ADMS 5.2 has been developed specifically for industrial point sources.[8] The model is widely used in the UK for environmental assessment and is

[6]Environment Agency, undated. Policy Statement EAS/2007/1/1

[7]Environment Agency, undated. Air Dispersion Modelling Report Requirements (for detailed dispersion modelling).

[8]CERC 2016. ADMS-5, The Multiple Source Air Dispersion Model. CERC, Cambridge.

generally considered by UK environmental agencies to be suitable for air quality impact assessment subject to its proper use.

4.9. Potential difficulties and limitations in this type of study when applied to air quality impact assessments include:

- Lack of good information about the risk to human health from process emissions. This assessment relies on the Environmental Assessment Levels (EALs) published by the Environment Agency;
- Uncertainties in baseline conditions. The baseline estimates used take account of available background estimates published by DEFRA;
- Errors in source terms used to estimate emissions. Emission rates are based on worst-case measured pollutant concentrations at a similar site elsewhere and air flow estimates provided by the operator;
- Errors inherent in the dispersion model used. The model is considered to be suitable for use in this application and has been validated for area sources; and
- Errors introduced by the model user due to the use of inappropriate or unrepresentative input values such as meteorological data or surface roughness values. A Sensitivity Analysis has been conducted to take these potential errors into account. The significance of these factors is discussed in Section 5. In general the approach used in this assessment has been to include worst case factors where these may otherwise lead to underestimates of worst case conditions.

4.10 This assessment presents a detailed account of the modelling process and considers the model sensitivity to the main user inputs. An inventory of the models run for this project is presented in Table 4.1 at the end of the text.

Dispersion Modelling

4.11 The transport and transformation of a pollutant in the boundary layer,[9] can be predicted with a reasonable degree of confidence using an appropriate mathematical model. The model used for this exercise is ADMS 5.2. This mathematical model enables the calculation of multiple sources and includes an algorithm for assessing flow around buildings that may cause entrainment. The principal factors affecting the concentration of a pollutant are:

- Source characteristics including source strength, height of discharge, density, and temperature of the release;
- Prevailing atmospheric conditions including wind speed, wind direction, cloud cover, precipitation, ambient temperature and the depth of the boundary layer; and

[9]The boundary layer is the layer of the atmosphere near the surface of the Earth that is affected by mechanical turbulence from surface friction and convective turbulence through local surface heating.

- Adjacent topography and local surface conditions.

These factors can be assigned numerical values and the resultant downwind concentrations of pollutants may be predicted.

4.12 The model description is published in the user guide for ADMS 5.2. The model was originally developed as a research project jointly funded by HSE, the Met Office and Her Majesty's Industrial Inspectorate of Pollution. The model is routinely used by UK environment agencies.[10]

Model Parameters

4.13 The temperature and efflux velocity of the stack gases are based on engineering estimates provided by the supplier. The emissions from the process are summarised in Table 4.2 in accordance with the requirements of H1[11] and Environment Agency Guidelines.

Source Condition, Location and Height

4.14 The emissions have been considered as continuous, steady state area source near ground level. The location of the proposed bio-filter is shown in Figure 2. The bio-filter release is assumed to be 1m above local ground level. The flow from the bio-filter has been modelled as a zero volume, zero velocity release.

4.15 The details of the proposed facility were obtained from the site planning drawings and the OS map base at 1:1250 and 1:10,000 scales.

Surface Roughness

4.16 The surface roughness conditions at the site have been assumed to have a surface roughness value of 0.5m as this is considered to represent worst case conditions for dispersion. This value has been used across the domain.

Meteorological Data

4.17 The selection of suitable meteorological data needs to be conducted with care. The main limiting factor for suitable meteorological data is continuous observations of cloud cover, used in the model to determine atmospheric stability.

4.18 Five years of hourly sequential meteorological data from RAF Scampton (2012 - 2016 inclusive) have been used to predict the dispersion around the site. Monks Wood is 34km to the south of the proposed installation and is likely to be reasonably representative of conditions at the study area. The worst case one year in five has been used in the assessment. A summary of the meteorological data is presented in Appendix 2. A model sensitivity analysis has also been conducted using 5 years of hourly sequential meteorological data for Wittering (2014 - 2018), which is

[10] Details of model validation studies are available at http://www.cerc.co.uk/software/publications.htm
[11] Environment Agency December 2011. H1 Risk Assessment Annex F v2.2

~29km to the south-east. Theses data has been used to assess worst case impacts for long-term exposure.

Building Effects

4.19 The release at near ground level so that building effects on dispersion have been discounted.

Terrain Effects

4.20 The land near the proposed installation is relatively level across the site, with only minor variations in ground level across the study area. The local topography is plotted in Figure 3. Terrain effects are unlikely to affect air flow and dispersion. Terrain effects have therefore been taken into account as a precaution.

Time Averaging and Percentiles

4.21 The averaging time for all pollutants is based on a 1 hour average. The 1 hour 100%ile has been calculated for pollutants where appropriate. Odour has been predicted using the 1 hour 98%ile and 100%ile.

Grid Resolution and Receptors

4.22 Predictions have been made at 20 fixed point receptor locations around the site to represent exposure at existing receptors and to assist with the model Sensitivity Analysis. These receptor locations are shown in Figure 1. The predictions have been modelled at a height of 1.5m above ground level.

4.23 Predictions have also been provided over the study area on a grid 43 by 36 at intervals of 100m where x1 = 465000; y1 = 385200; x2 – 469800; and y2 = 388700.

Removal Effects

4.24 Atmospheric chemistry and photo-lytic reactions have been ignored in the dispersion modelling.

Overview of the Modelling Process

4.25 Details of the ADMS dispersion model runs are presented in Table 4.1 at the end of the text.

5.0 IMPACT ASSESSMENT RESULTS

Model Sensitivity Analysis

5.1. It is a requirement of the Royal Meteorological Society Guidelines on Dispersion Modelling[12&13] that studies should include a Sensitivity Analysis for model inputs, to provide an estimate of the possible errors in the predictions. The potential errors in predictions and limits to the dispersion model were outlined in Section 4. The Sensitivity Analysis conducted for this study is based on the findings of the model sensitivity analysis. The results for the model sensitivity analysis are presented in Appendix 3. The model predictions are based on the worst case one year in five, and allow for topography effects and worst case surface roughness conditions.

Results – Human Health

5.2. The predicted contours for airborne Benzene for Scenario 1, excluding background, are plotted in Figure 4. This indicates that the predicted annual mean concentration of Benzene is below the significance threshold of 1% of the EAL for human exposure. The predicted concentrations for all pollutants at sensitive receptors are included within Appendix 3 and summarised in Table 5.1 below.

Table 5.1 - Worst Case Predicted Levels at Sensitive Receptors (Scenario 1)

Pollutant	Long-term	Short-term
	ug/m^3	ug/m^3
Benzene	0.00031	0.0534
Toluene	0.00495	0.8545
Ethylbenzene	0.00046	0.0790
Xylene	0.00124	0.2136

5.3. These predictions are based on worst case dispersion conditions for meteorology and surface roughness. The criteria used to assess the significance of pollutants were presented in Table 2.2. The significance of these predicted concentrations may be determined from Table 5.2 below, where the predicted process contribution is expressed as a percentage of the Environmental Assessment Level. Impacts are insignificant where the process contribution is <1% of the long-term EAL.

Table 5.2 – Significance of Worst Case Predicted Levels at Sensitive Receptors

Pollutant	Long term	Short term
	ug/m^3	ug/m^3
Benzene	0%	-
Toluene	0%	0%
Ethylbenzene	0%	0%
Xylene	0%	0%

N.B. columns are blank where there is no relevant EAL. (Scenario 1)

[12]Royal Meteorological Society May 1995. Policy Statement Atmospheric Dispersion Modelling. Guidelines on the justification of choice and use of models and the communication and reporting of results

[13]ADMLC 2004. Guidelines for the Preparation of Dispersion Modelling Assessments for Compliance with Regulatory Requirements – an Update to the 1995 Royal Meteorological Society Guidance

5.4. This indicates that the process contributions are predicted to be well below the relevant EALs.

Model Headroom

5.5. The Environment Agency's method for assessing model uncertainty[14] indicates that confidence in the model is high for both short and long-term exposure based on Benzene (assuming Scenario 1 emissions).

Results - Odour

5.15. The predicted odour at the nearest sensitive receptors are well below the odour detection threshold for all pollutants.

[14] Ji Ping Shi and Betty Ng; 2004. Risk based pragmatic approach to address model uncertainty. Air Quality Modelling and Assessment Unit The Environment Agency 29 Newport Road Cardiff CF24 0TP. Paper Given At NSCA Seminar.

6.0 PROPOSED MITIGATION MEASURES

Operational Impacts

6.1 The following measures are proposed to prevent or minimise impacts on air pollution:

- The waste acceptance criteria for the proposed facility shall ensure that only suitable materials are deposited within the aerated static piles.
- The air stream into the bio-filter shall be cleaned to prevent dust loading into the filter media.
- The condition of the bio-filter bed shall be tested on a monthly basis to ensure satisfactory performance.
- Supervisory staff shall be trained to ensure that the facility is operated within specification.
- All process operations shall be subject to routine planned preventative maintenance.
- Environmental monitoring shall be conducted to confirm the pollutant concentrations are within the assumed levels and to ensure compliance with Environmental Assessment Levels.

7.0 EVALUATION OF IMPACTS

Human Exposure

7.1 The assessment takes account of the worst case model predictions, the relevant Environmental Assessment Levels (EAL) and the significance criteria set out in Tables 2.1 – 2.2.

7.2 The predicted impacts from the proposed facility are insignificant at all sensitive receptors in terms of the assessment framework set out in Table 2.2, where all pollutants are <1% of the EAL.

7.3 Odour impacts from the proposed facility are predicted to be negligible.

Tables

Item	Description	dimensions [1]	volume of air [2]	pollutant [3]	maximum reported concentration [4]	maximum emission rate [5]	maximum emission rate [5]
		m^2	m3/s		ug/m^3	g/s	$g/m^2/s$
1	bio-filter surface	475	2.778	Benzene	10	2.778E-05	5.848E-08
		475	2.778	Toluene	160	4.444E-04	9.357E-07
		475	2.778	Ethlbenzene	14.8	4.111E-05	8.655E-08
		475	2.778	m/p-Xylene	30	8.333E-05	1.754E-07
		475	2.778	o-Xylene	10	2.778E-05	5.848E-08

Notes

1. from drawing Daneshill No. 1. Provectus FCC Environment Provisional Layout September 2019
2. Email from Jon Owens Provectus to Andy Stocks Caulmert 28th November 2019
3. The species considered in this assessment are based on the available data from measurements at a similar facility elsewhere
4. Based on the maximum reported pollutant concentration at a similar site elsewhere.
5. No correction has been applied for STP or moisture

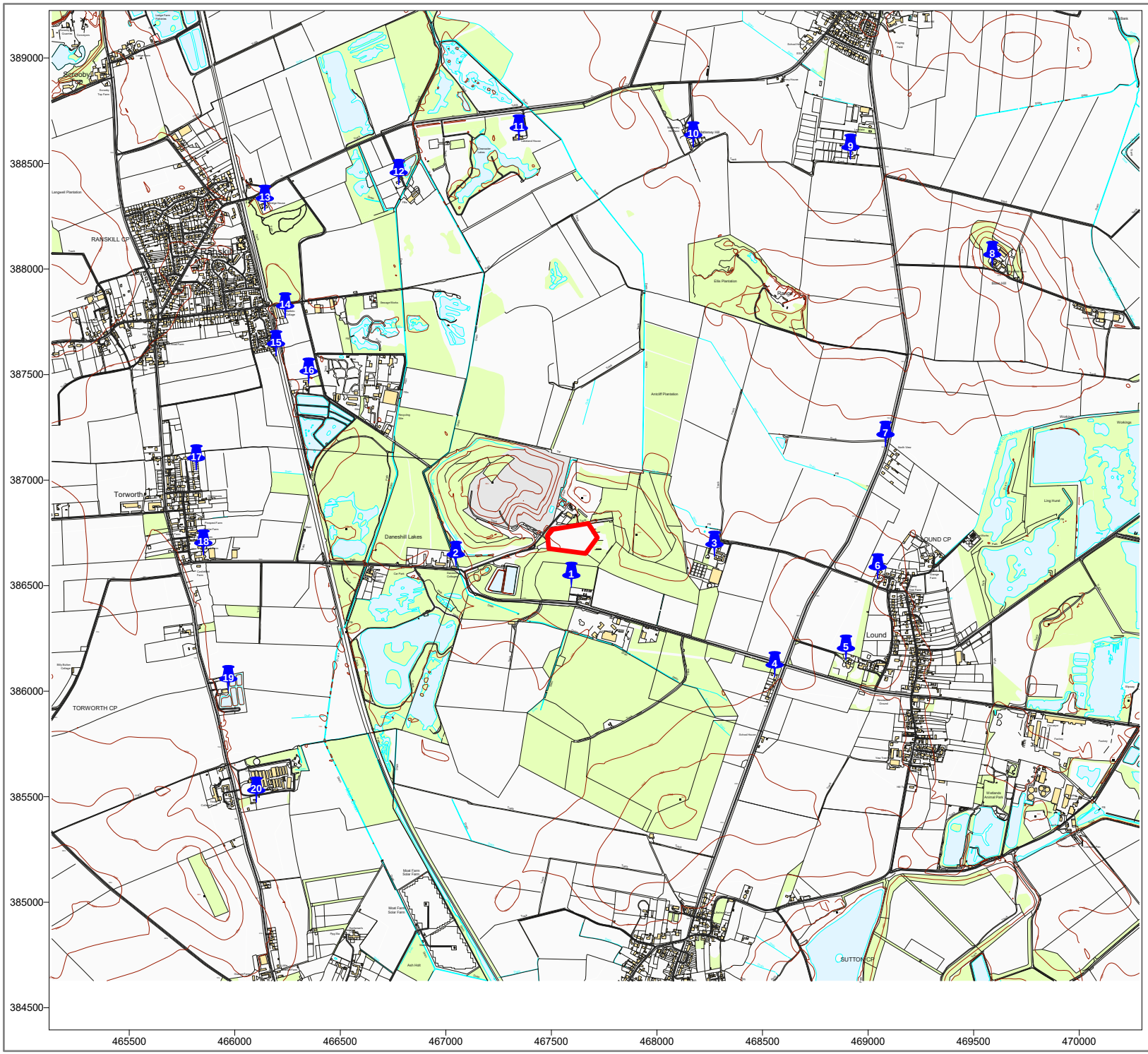
Results from sampling at bio-filter outlet Provectus Remediation Ltd Edwin Richards Quarry April 2018 - October 2019

BTEX	09-Apr-18	12-Mar-18	01-May-18	16-May-18	05-Jul-18	27-Jul-18	03-Sep-18	15-Oct-18	14-Nov-18	14-Nov-18	28-Dec-18	31-Jan-19	27-Feb-19	29-Mar-19	29-Apr-19	10-May-19	10-May-19	10-May-19	10-May-19	28-Jun-19	28-Jun-19	30-Jul-19	30-Aug-19	02-Oct-19	Max	average
Benzene	2.3	1.7	1.7	1.7	1.7	7.9	7.5	3.8	2.3	1.7	10	2	2	2	3	2	2	2	5	2	8	2	2	2	10	3
Toluene	5.3	2	1.7	2	1.7	11.1	9.2	4.9	2	1.7	10	10	20	10	20	3	20	20	30	20	40	30	160	53	160	20
Ethlbenzene	1.7	14.8	1.7	1.7	1.7	3.4	1.8	1.8	1.7	1.7	2	2	6	2	5	2	5	3	5	6	10	6	2	2	14.8	4
m/p-Xylene	1.9	10.9	1.7	1.7	1.7	15.1	8.4	6.7	1.7	1.7	3	6	20	7	10	3	10	6	9	20	30	20	4	4	30	8
o-Xylene	1.7	4	1.7	1.7	1.7	6.5	4.3	2.8	1.7	1.7	2	2	5	3	4	2	4	3	4	7	10	10	2	2	10	4

Model Inventory

Run	Name		Met Data	Surface roughness at site (m)	terrain	objective
1	Scampton 2014	.apl	Scampton 2014	0.3	off	
2	Scampton 2015	.apl	Scampton 2015	0.3	off	
3	Scampton 2016	.apl	Scampton 2016	0.3	off	
4	Scampton 2017	.apl	Scampton 2017	0.3	off	
5	Scampton 2018	.apl	Scampton 2018	0.3	off	to predict deposition for range of met. conditions
6	rough 0.3m	.apl	Scampton 2016	0.3	off	
7	rough 0.5m	.apl	Scampton 2016	0.5	off	
8	rough 1.0m	.apl	Scampton 2016	1.0	off	to assess significance of surface roughness on dispersion
9	terrain	.apl	Scampton 2016	0.3	on	to assess significance of terrain on dispersion
9	Scenario 1	.apl	Scampton 2016	0.3	off	to provide predictions for worst case dispersion conditions

Figures



Site Location

indicative site location

sensitive receptor considered in study

Figure 1

The Airshed

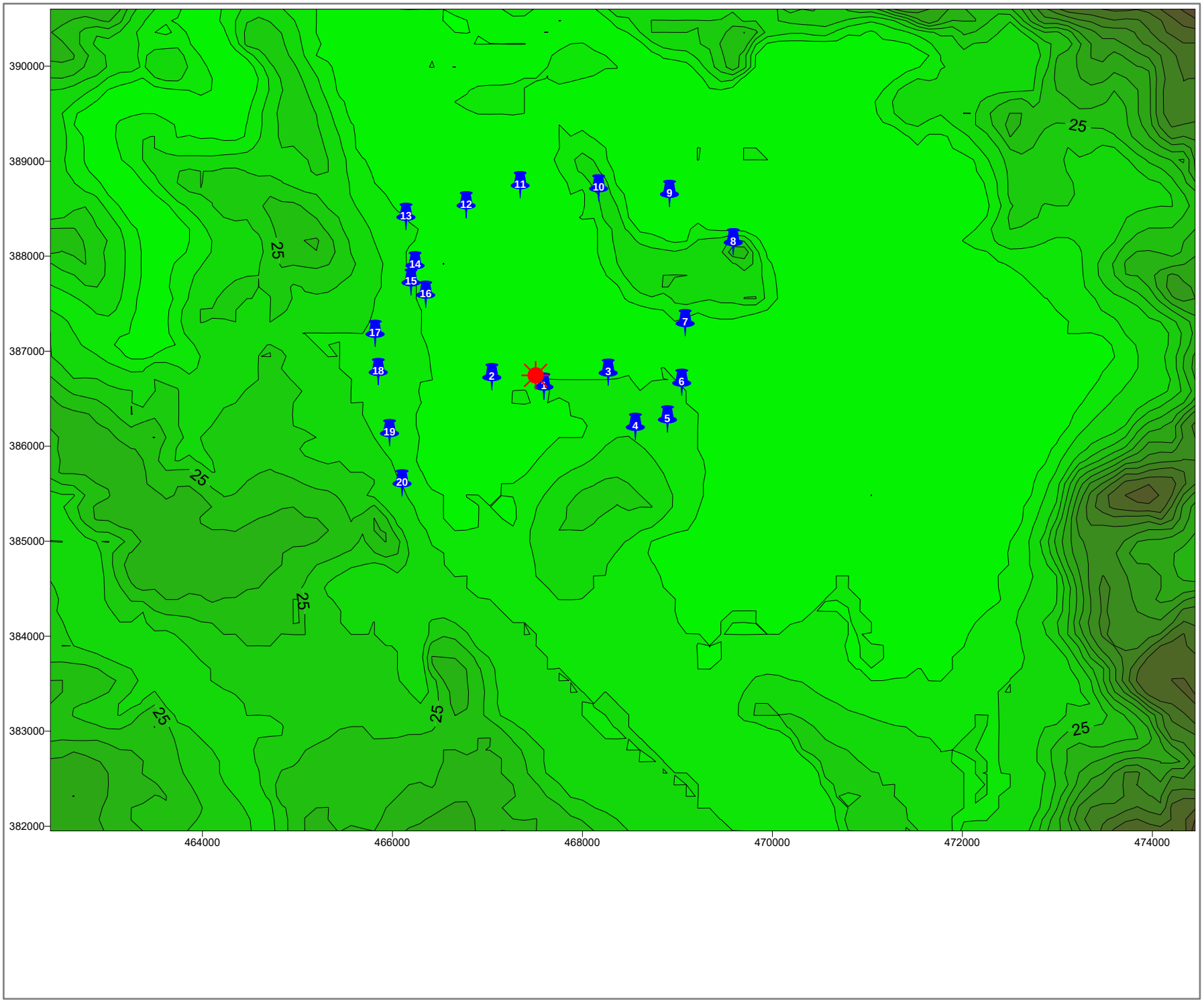
Model Layout

bio-filter

sensitive receptor considered in study

Figure 2

The Airshed



Topography

indicative location of bio-filter

sensitive receptor considered in study

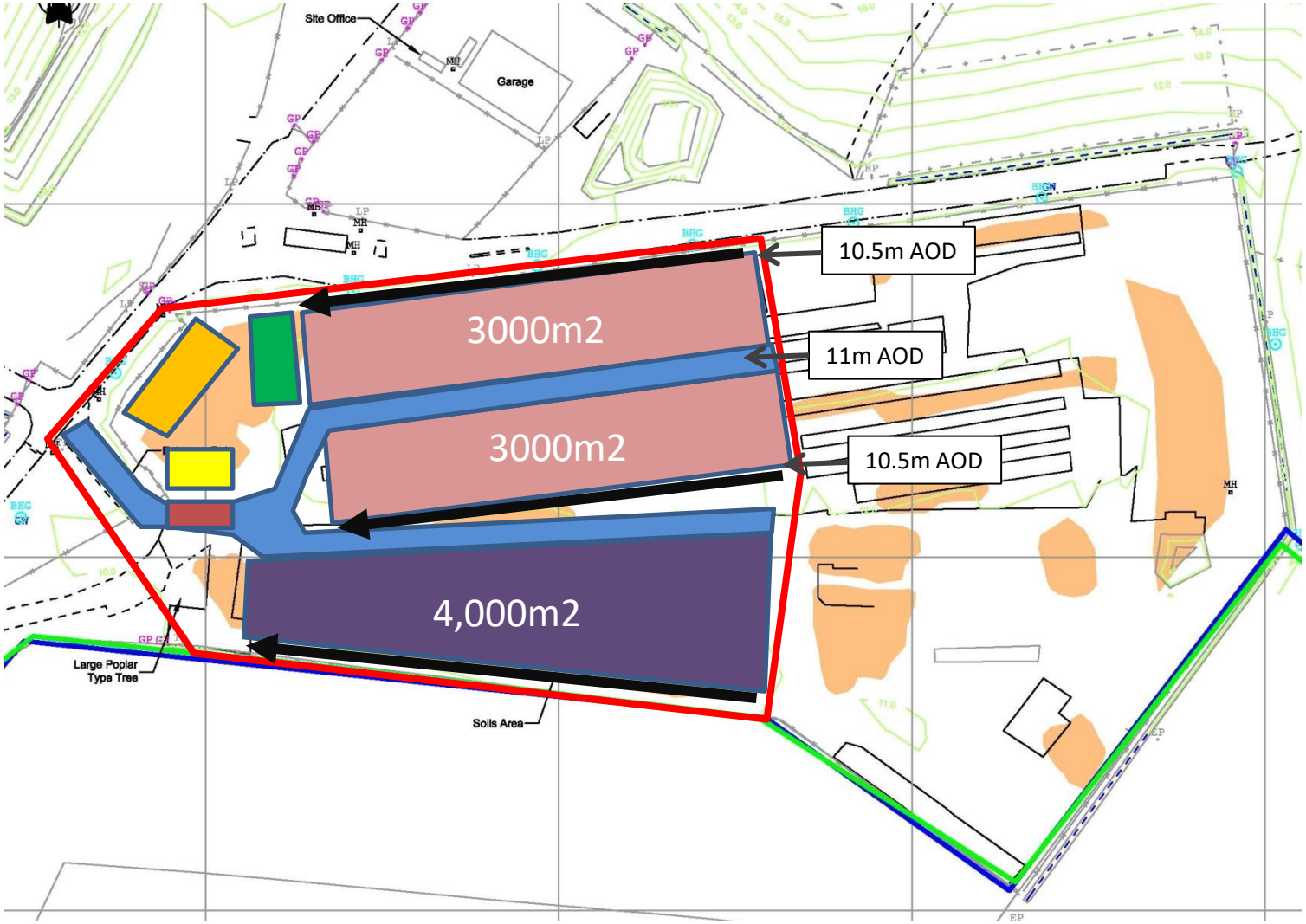
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0

OS Landform Panorama mAOD

Figure 3

The Airshed

Appendix 1 – Project Description



- Biofilter (475m2)
- Biotreatment Area
- Screening/Processing
- Soil and Water Treatment Equipment
- Site Office
- Relocated Weighbridge
- Access Roads
- Fall of Drainage

PROVECTUS

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Wyvols Court
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RG7 1WY

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www.provectusgroup.com

Client: FCC Environment

Project: Daneshill

Job No.: P268

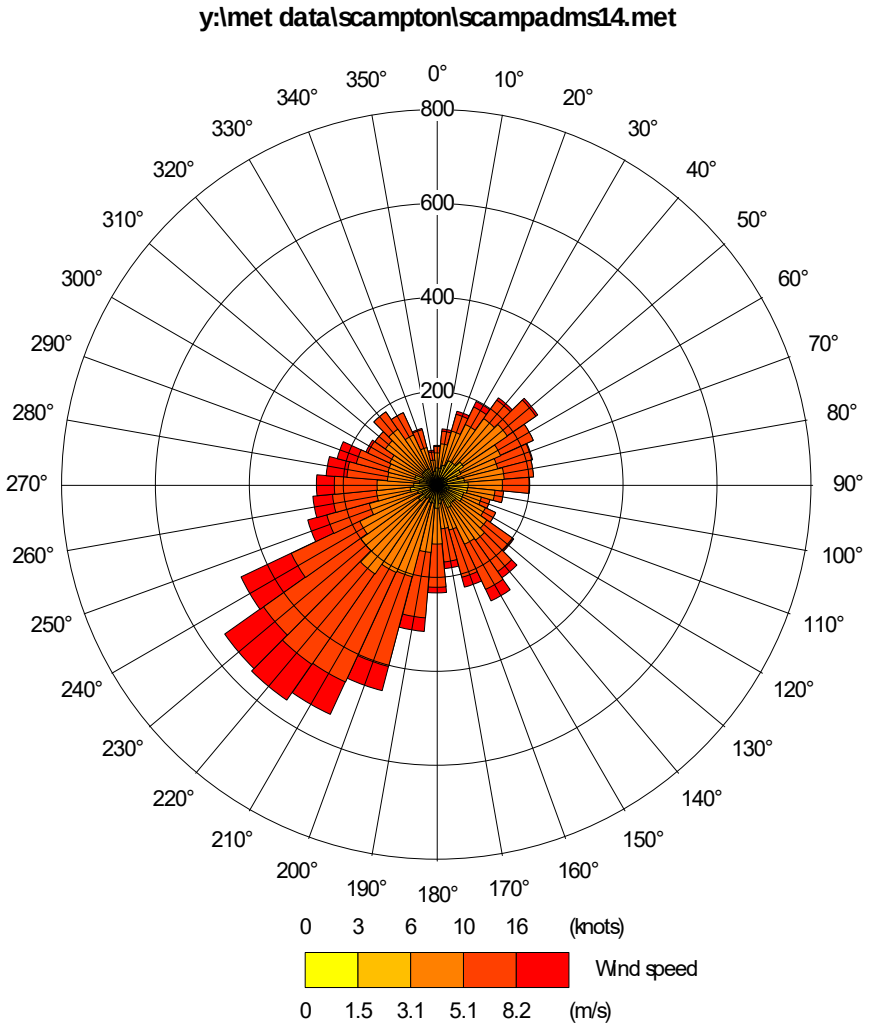
Title: Provisional Layout

Scale: NTS

Date Drawn: September 2019

Drawing No.: Daneshill 1

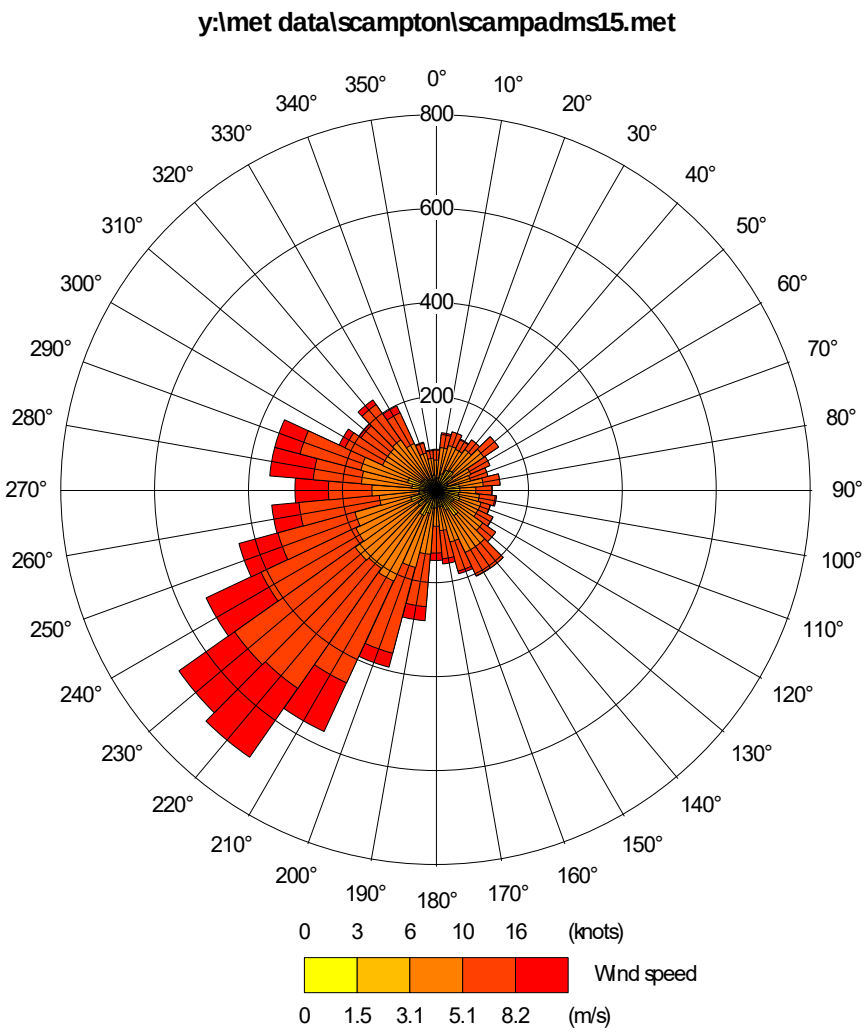
Appendix 2 – Model Inputs



Met Data

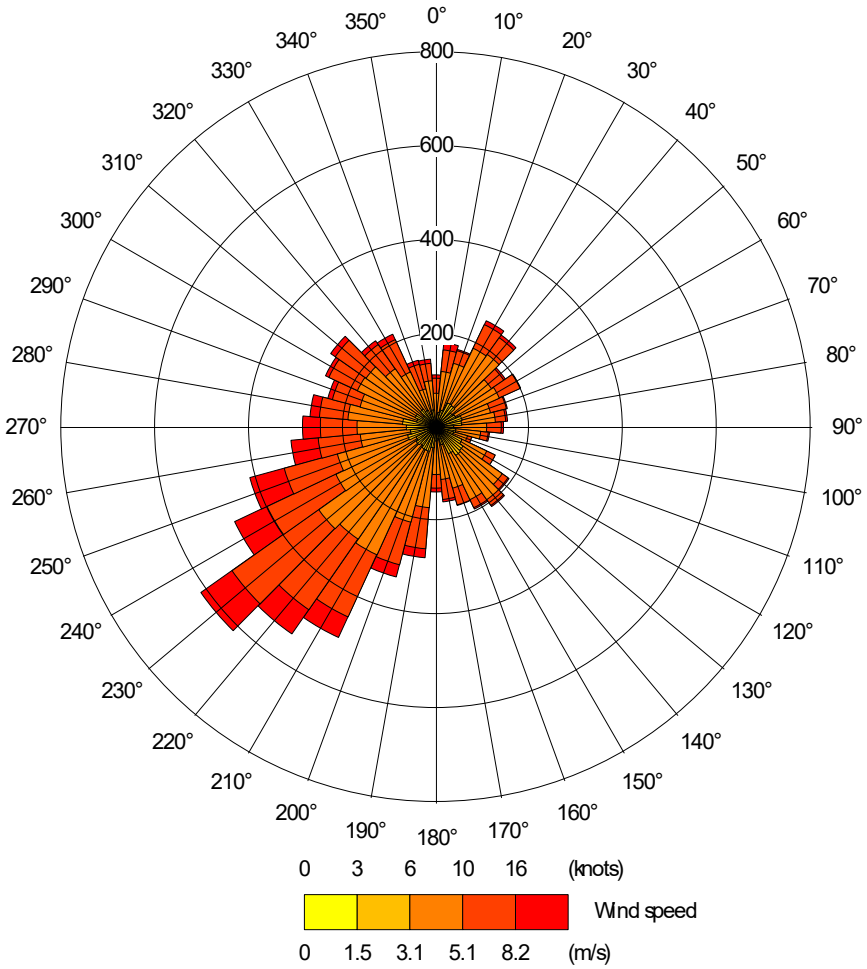
Appendix 2

Met Data



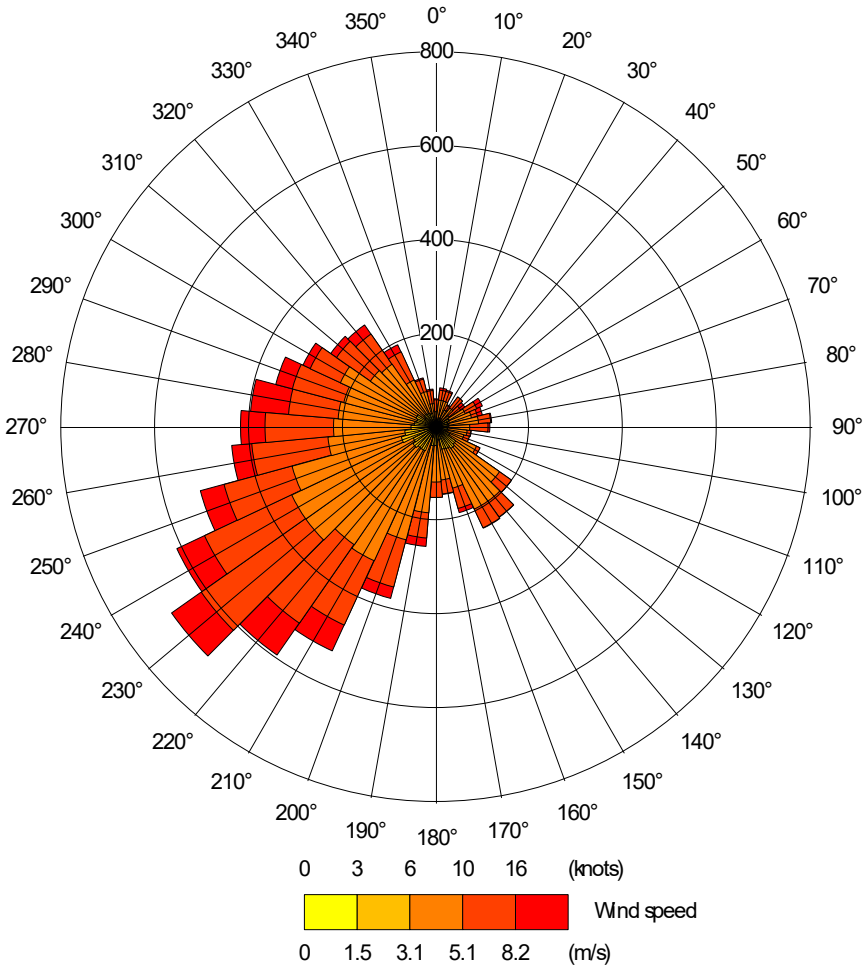
Appendix 2

y:\met data\scampton\scampadms16.met



Met Data

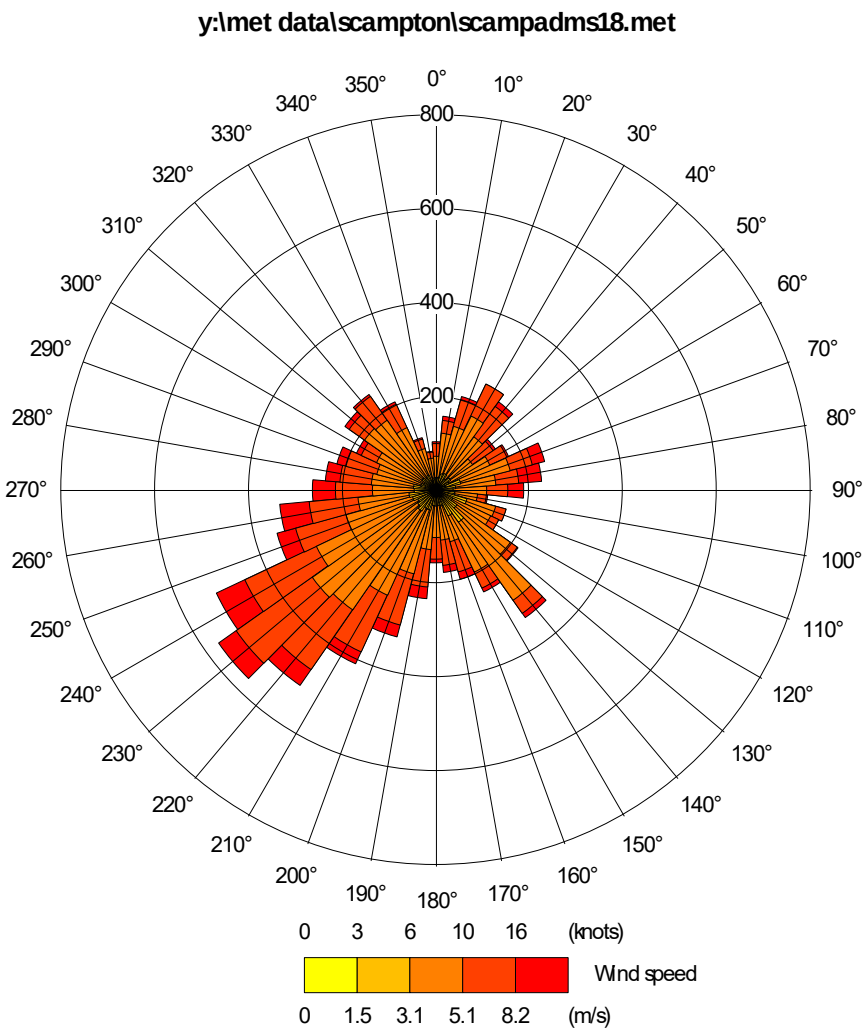
Appendix 2



Met Data

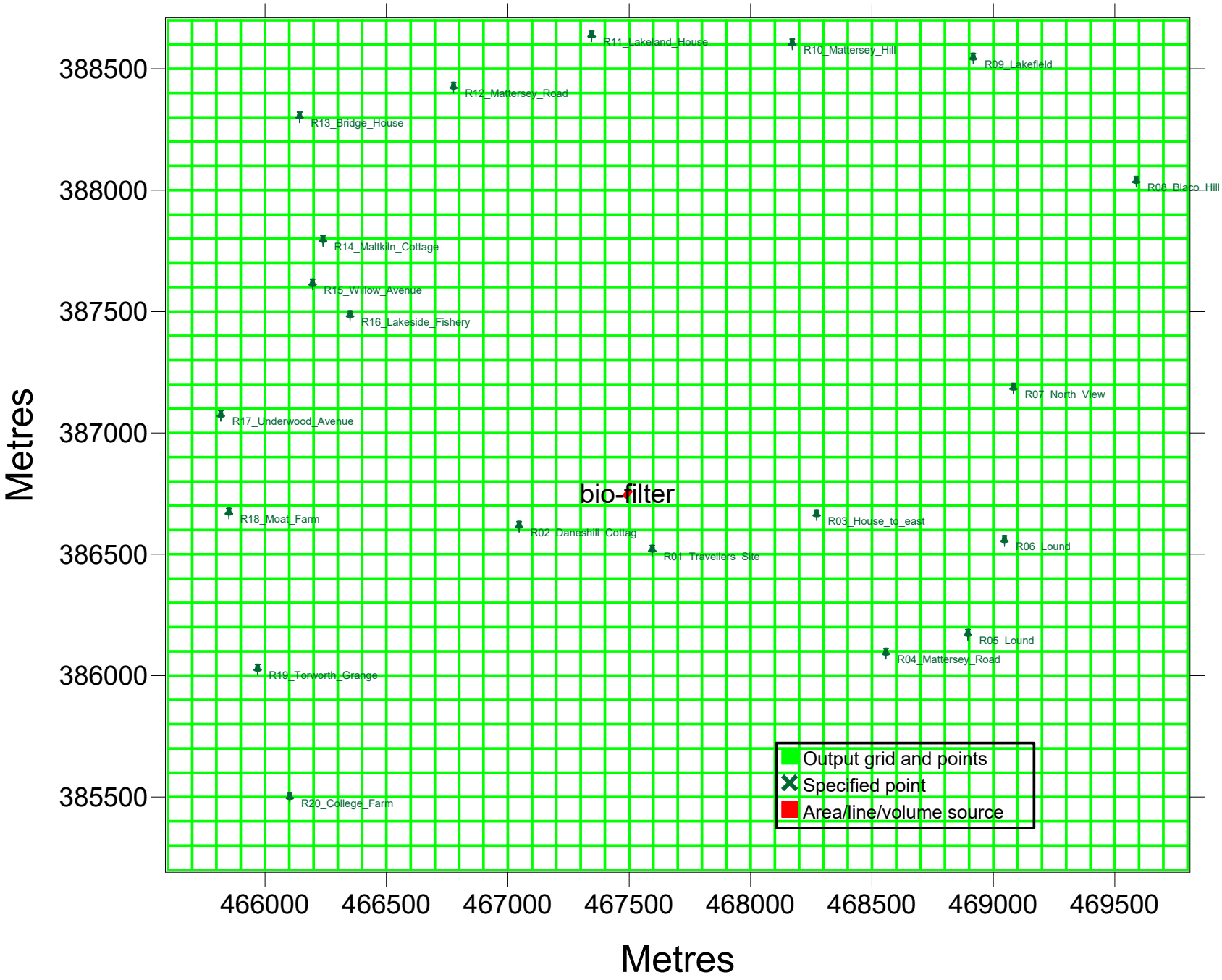
Appendix 2

Met Data



Appendix 2

Visualisation of ADMS input
P:\files\AS 0732 Daneshill Soil Vapour\model runs\Scenario 1.APL



Appendix 3 – Model Outputs

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00018	0.02964	0.00188
2	Daneshill Cottage	467047	386590	0.00014	0.01306	0.00168
3	House to east	468272	386638	0.00005	0.00556	0.00056
4	Mattersey Road	468558	386067	0.00002	0.00256	0.00023
5	Lound	468895	386146	0.00001	0.00193	0.00016
6	Lound	469046	386531	0.00001	0.00180	0.00017
7	North View	469083	387159	0.00002	0.00172	0.00020
8	Blaco Hill	469589	388011	0.00001	0.00090	0.00012
9	Lakefield	468917	388519	0.00001	0.00101	0.00013
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00017
11	Lakeland House	467346	388611	0.00001	0.00140	0.00014
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00014
13	Bridge House	466143	388277	0.00001	0.00121	0.00015
14	Maltkiln Cottage	466239	387768	0.00002	0.00170	0.00023
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00024
16	Lakeside Fishery	466351	387458	0.00002	0.00240	0.00031
17	Underwood Avenue	465818	387047	0.00002	0.00161	0.00024
18	Moat Farm	465851	386645	0.00002	0.00171	0.00024
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00018
20	College Farm	466102	385473	0.00001	0.00136	0.00017
Max				0.00018	0.02964	0.00188

model sensitivity analysis
met data variability
Scampton 2014
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00020	0.03068	0.00202
2	Daneshill Cottage	467047	386590	0.00010	0.01306	0.00090
3	House to east	468272	386638	0.00007	0.00575	0.00078
4	Mattersey Road	468558	386067	0.00002	0.00264	0.00025
5	Lound	468895	386146	0.00002	0.00193	0.00021
6	Lound	469046	386531	0.00002	0.00186	0.00024
7	North View	469083	387159	0.00002	0.00172	0.00020
8	Blaco Hill	469589	388011	0.00001	0.00090	0.00012
9	Lakefield	468917	388519	0.00001	0.00101	0.00013
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00018
11	Lakeland House	467346	388611	0.00001	0.00140	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00013
13	Bridge House	466143	388277	0.00001	0.00121	0.00014
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00021
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00022
16	Lakeside Fishery	466351	387458	0.00002	0.00240	0.00029
17	Underwood Avenue	465818	387047	0.00002	0.00161	0.00015
18	Moat Farm	465851	386645	0.00001	0.00171	0.00012
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00010
20	College Farm	466102	385473	0.00001	0.00136	0.00010
Max				0.00020	0.03068	0.00202

model sensitivity analysis
met data variability
Scampton 2015
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00025	0.03068	0.00240
2	Daneshill Cottage	467047	386590	0.00014	0.01306	0.00166
3	House to east	468272	386638	0.00007	0.00575	0.00093
4	Mattersey Road	468558	386067	0.00003	0.00264	0.00029
5	Lound	468895	386146	0.00002	0.00193	0.00023
6	Lound	469046	386531	0.00002	0.00186	0.00030
7	North View	469083	387159	0.00002	0.00172	0.00030
8	Blaco Hill	469589	388011	0.00001	0.00086	0.00015
9	Lakefield	468917	388519	0.00002	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00022
11	Lakeland House	467346	388611	0.00001	0.00140	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00014
13	Bridge House	466143	388277	0.00001	0.00121	0.00019
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00032
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00030
16	Lakeside Fishery	466351	387458	0.00003	0.00240	0.00035
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00009
18	Moat Farm	465851	386645	0.00001	0.00171	0.00014
19	Torworth Grange	465970	386001	0.00002	0.00161	0.00017
20	College Farm	466102	385473	0.00001	0.00136	0.00015
Max				0.00025	0.03068	0.00240

model sensitivity analysis
met data variability
Scampton 2016
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00016	0.03068	0.00150
2	Daneshill Cottage	467047	386590	0.00008	0.01198	0.00083
3	House to east	468272	386638	0.00007	0.00575	0.00084
4	Mattersey Road	468558	386067	0.00002	0.00256	0.00024
5	Lound	468895	386146	0.00002	0.00193	0.00021
6	Lound	469046	386531	0.00002	0.00186	0.00026
7	North View	469083	387159	0.00003	0.00172	0.00033
8	Blaco Hill	469589	388011	0.00002	0.00090	0.00018
9	Lakefield	468917	388519	0.00002	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00019
11	Lakeland House	467346	388611	0.00001	0.00140	0.00013
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00013
13	Bridge House	466143	388277	0.00001	0.00121	0.00016
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00025
15	Willow Avenue	466196	387589	0.00002	0.00176	0.00024
16	Lakeside Fishery	466351	387458	0.00002	0.00229	0.00029
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00008
18	Moat Farm	465851	386645	0.00001	0.00171	0.00008
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00008
20	College Farm	466102	385473	0.00001	0.00136	0.00004
Max				0.00016	0.03068	0.00150

model sensitivity analysis
met data variability
Scampton 2017
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00021	0.03068	0.00218
2	Daneshill Cottage	467047	386590	0.00013	0.01306	0.00128
3	House to east	468272	386638	0.00006	0.00575	0.00062
4	Mattersey Road	468558	386067	0.00002	0.00264	0.00028
5	Lound	468895	386146	0.00002	0.00190	0.00017
6	Lound	469046	386531	0.00002	0.00186	0.00019
7	North View	469083	387159	0.00002	0.00172	0.00022
8	Blaco Hill	469589	388011	0.00001	0.00090	0.00012
9	Lakefield	468917	388519	0.00001	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00016
11	Lakeland House	467346	388611	0.00001	0.00133	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00012
13	Bridge House	466143	388277	0.00002	0.00121	0.00024
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00036
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00030
16	Lakeside Fishery	466351	387458	0.00003	0.00240	0.00037
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00017
18	Moat Farm	465851	386645	0.00001	0.00171	0.00014
19	Torworth Grange	465970	386001	0.00001	0.00161	0.00016
20	College Farm	466102	385473	0.00001	0.00136	0.00010
Max				0.00021	0.03068	0.00218

model sensitivity analysis
met data variability
Scampton 2018
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00031	0.05341	0.00269
2	Daneshill Cottage	467047	386590	0.00020	0.02288	0.00217
3	House to east	468272	386638	0.00009	0.00928	0.00111
4	Mattersey Road	468558	386067	0.00003	0.00446	0.00032
5	Lound	468895	386146	0.00002	0.00320	0.00026
6	Lound	469046	386531	0.00003	0.00296	0.00034
7	North View	469083	387159	0.00003	0.00234	0.00035
8	Blaco Hill	469589	388011	0.00001	0.00149	0.00017
9	Lakefield	468917	388519	0.00002	0.00168	0.00018
10	Mattersey Hill	468172	388578	0.00002	0.00208	0.00025
11	Lakeland House	467346	388611	0.00002	0.00233	0.00012
12	Mattersey Road	466777	388399	0.00002	0.00250	0.00018
13	Bridge House	466143	388277	0.00002	0.00202	0.00023
14	Maltkiln Cottage	466239	387768	0.00003	0.00296	0.00038
15	Willow Avenue	466196	387589	0.00003	0.00317	0.00037
16	Lakeside Fishery	466351	387458	0.00004	0.00404	0.00044
17	Underwood Avenue	465818	387047	0.00002	0.00274	0.00012
18	Moat Farm	465851	386645	0.00002	0.00289	0.00017
19	Torworth Grange	465970	386001	0.00002	0.00275	0.00021
20	College Farm	466102	385473	0.00002	0.00222	0.00018
Max				0.00031	0.05341	0.00269

model sensitivity analysis
surface roughness
Scampton 2016
surface roughness 0.3m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00025	0.03068	0.00240
2	Daneshill Cottage	467047	386590	0.00014	0.01306	0.00166
3	House to east	468272	386638	0.00007	0.00575	0.00093
4	Mattersey Road	468558	386067	0.00003	0.00264	0.00029
5	Lound	468895	386146	0.00002	0.00193	0.00023
6	Lound	469046	386531	0.00002	0.00186	0.00030
7	North View	469083	387159	0.00002	0.00172	0.00030
8	Blaco Hill	469589	388011	0.00001	0.00086	0.00015
9	Lakefield	468917	388519	0.00002	0.00101	0.00016
10	Mattersey Hill	468172	388578	0.00002	0.00128	0.00022
11	Lakeland House	467346	388611	0.00001	0.00140	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00148	0.00014
13	Bridge House	466143	388277	0.00001	0.00121	0.00019
14	Maltkiln Cottage	466239	387768	0.00002	0.00177	0.00032
15	Willow Avenue	466196	387589	0.00002	0.00190	0.00030
16	Lakeside Fishery	466351	387458	0.00003	0.00240	0.00035
17	Underwood Avenue	465818	387047	0.00001	0.00161	0.00009
18	Moat Farm	465851	386645	0.00001	0.00171	0.00014
19	Torworth Grange	465970	386001	0.00002	0.00161	0.00017
20	College Farm	466102	385473	0.00001	0.00136	0.00015
Max				0.00025	0.03068	0.00240

model sensitivity analysis
surface roughness
Scampton 2016
surface roughness 0.5m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00022	0.01970	0.00226
2	Daneshill Cottage	467047	386590	0.00012	0.00852	0.00158
3	House to east	468272	386638	0.00006	0.00371	0.00087
4	Mattersey Road	468558	386067	0.00002	0.00171	0.00026
5	Lound	468895	386146	0.00002	0.00126	0.00022
6	Lound	469046	386531	0.00002	0.00121	0.00027
7	North View	469083	387159	0.00002	0.00112	0.00028
8	Blaco Hill	469589	388011	0.00001	0.00054	0.00014
9	Lakefield	468917	388519	0.00001	0.00066	0.00015
10	Mattersey Hill	468172	388578	0.00002	0.00085	0.00022
11	Lakeland House	467346	388611	0.00001	0.00091	0.00010
12	Mattersey Road	466777	388399	0.00001	0.00097	0.00013
13	Bridge House	466143	388277	0.00001	0.00078	0.00017
14	Maltkiln Cottage	466239	387768	0.00002	0.00115	0.00028
15	Willow Avenue	466196	387589	0.00002	0.00124	0.00028
16	Lakeside Fishery	466351	387458	0.00002	0.00155	0.00034
17	Underwood Avenue	465818	387047	0.00001	0.00106	0.00010
18	Moat Farm	465851	386645	0.00001	0.00112	0.00014
19	Torworth Grange	465970	386001	0.00001	0.00107	0.00018
20	College Farm	466102	385473	0.00001	0.00089	0.00014
Max				0.00022	0.01970	0.00226

model sensitivity analysis
surface roughness
Scampton 2016
surface roughness 1.0m
terrain effects off

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00023	0.01934	0.00258
2	Daneshill Cottage	467047	386590	0.00012	0.00944	0.00188
3	House to east	468272	386638	0.00007	0.00399	0.00103
4	Mattersey Road	468558	386067	0.00002	0.00171	0.00027
5	Lound	468895	386146	0.00002	0.00125	0.00022
6	Lound	469046	386531	0.00002	0.00122	0.00035
7	North View	469083	387159	0.00002	0.00115	0.00030
8	Blaco Hill	469589	388011	0.00001	0.00056	0.00010
9	Lakefield	468917	388519	0.00001	0.00060	0.00017
10	Mattersey Hill	468172	388578	0.00002	0.00083	0.00023
11	Lakeland House	467346	388611	0.00001	0.00090	0.00012
12	Mattersey Road	466777	388399	0.00001	0.00092	0.00016
13	Bridge House	466143	388277	0.00001	0.00077	0.00022
14	Maltkiln Cottage	466239	387768	0.00002	0.00122	0.00036
15	Willow Avenue	466196	387589	0.00002	0.00127	0.00034
16	Lakeside Fishery	466351	387458	0.00002	0.00163	0.00041
17	Underwood Avenue	465818	387047	0.00001	0.00108	0.00009
18	Moat Farm	465851	386645	0.00001	0.00115	0.00021
19	Torworth Grange	465970	386001	0.00001	0.00106	0.00014
20	College Farm	466102	385473	0.00001	0.00091	0.00014
Max				0.00023	0.01934	0.00258

model sensitivity analysis
terrain effects
Scampton 2016
surface roughness 0.3m
terrain effects on

No	Receptor name	X(m)	Y(m)	LTConc|ug/m3|BENZENE|<All sources>|-| 1hr	P100.00|ug/m3|BENZENE|<All sources>|-| 1hr	P 98.00|ug/m3|BENZENE|<All sources>|-| 1hr
1	Travellers Site	467595	386491	0.00031	0.05341	0.00269
2	Daneshill Cottage	467047	386590	0.00020	0.02288	0.00217
3	House to east	468272	386638	0.00009	0.00928	0.00111
4	Mattersey Road	468558	386067	0.00003	0.00446	0.00032
5	Lound	468895	386146	0.00002	0.00320	0.00026
6	Lound	469046	386531	0.00003	0.00296	0.00034
7	North View	469083	387159	0.00003	0.00234	0.00035
8	Blaco Hill	469589	388011	0.00001	0.00149	0.00017
9	Lakefield	468917	388519	0.00002	0.00168	0.00018
10	Mattersey Hill	468172	388578	0.00002	0.00208	0.00025
11	Lakeland House	467346	388611	0.00002	0.00233	0.00012
12	Mattersey Road	466777	388399	0.00002	0.00250	0.00018
13	Bridge House	466143	388277	0.00002	0.00202	0.00023
14	Maltkiln Cottage	466239	387768	0.00003	0.00296	0.00038
15	Willow Avenue	466196	387589	0.00003	0.00317	0.00037
16	Lakeside Fishery	466351	387458	0.00004	0.00404	0.00044
17	Underwood Avenue	465818	387047	0.00002	0.00274	0.00012
18	Moat Farm	465851	386645	0.00002	0.00289	0.00017
19	Torworth Grange	465970	386001	0.00002	0.00275	0.00021
20	College Farm	466102	385473	0.00002	0.00222	0.00018
Max				0.00031	0.05341	0.00269

Scenario 1
worst-case dispersopm conditons
Scampton 2016
surface roughness 0.3m
terrain effects off

No	Receptor name	X(m)	Y(m)	Benzene	Toluene	Ethylbenzene	Xylene
1	Travellers Site	467595	386491	0.00031	0.00495	0.00046	0.00124
2	Daneshill Cottage	467047	386590	0.00020	0.00322	0.00030	0.00080
3	House to east	468272	386638	0.00009	0.00146	0.00013	0.00036
4	Mattersey Road	468558	386067	0.00003	0.00051	0.00005	0.00013
5	Lound	468895	386146	0.00002	0.00037	0.00003	0.00009
6	Lound	469046	386531	0.00003	0.00045	0.00004	0.00011
7	North View	469083	387159	0.00003	0.00044	0.00004	0.00011
8	Blaco Hill	469589	388011	0.00001	0.00024	0.00002	0.00006
9	Lakefield	468917	388519	0.00002	0.00031	0.00003	0.00008
10	Mattersey Hill	468172	388578	0.00002	0.00040	0.00004	0.00010
11	Lakeland House	467346	388611	0.00002	0.00025	0.00002	0.00006
12	Mattersey Road	466777	388399	0.00002	0.00027	0.00003	0.00007
13	Bridge House	466143	388277	0.00002	0.00030	0.00003	0.00008
14	Maltkiln Cottage	466239	387768	0.00003	0.00048	0.00004	0.00012
15	Willow Avenue	466196	387589	0.00003	0.00050	0.00005	0.00013
16	Lakeside Fishery	466351	387458	0.00004	0.00062	0.00006	0.00016
17	Underwood Avenue	465818	387047	0.00002	0.00027	0.00003	0.00007
18	Moat Farm	465851	386645	0.00002	0.00031	0.00003	0.00008
19	Torworth Grange	465970	386001	0.00002	0.00035	0.00003	0.00009
20	College Farm	466102	385473	0.00002	0.00028	0.00003	0.00007
Max				0.00031	0.00495	0.00046	0.00124

Scenario 1
units = ug/m3

No	Receptor name	X(m)	Y(m)	Benzene	Toluene	Ethylbenzene	Xylene
1	Travellers Site	467595	386491	0.05341	0.85453	0.07904	0.21363
2	Daneshill Cottage	467047	386590	0.02288	0.36608	0.03386	0.09152
3	House to east	468272	386638	0.00928	0.14847	0.01373	0.03712
4	Mattersey Road	468558	386067	0.00446	0.07136	0.00660	0.01784
5	Lound	468895	386146	0.00320	0.05117	0.00473	0.01279
6	Lound	469046	386531	0.00296	0.04734	0.00438	0.01183
7	North View	469083	387159	0.00234	0.03742	0.00346	0.00936
8	Blaco Hill	469589	388011	0.00149	0.02377	0.00220	0.00594
9	Lakefield	468917	388519	0.00168	0.02692	0.00249	0.00673
10	Mattersey Hill	468172	388578	0.00208	0.03332	0.00308	0.00833
11	Lakeland House	467346	388611	0.00233	0.03735	0.00345	0.00934
12	Mattersey Road	466777	388399	0.00250	0.03996	0.00370	0.00999
13	Bridge House	466143	388277	0.00202	0.03234	0.00299	0.00809
14	Maltkiln Cottage	466239	387768	0.00296	0.04741	0.00439	0.01185
15	Willow Avenue	466196	387589	0.00317	0.05066	0.00469	0.01266
16	Lakeside Fishery	466351	387458	0.00404	0.06470	0.00598	0.01617
17	Underwood Avenue	465818	387047	0.00274	0.04385	0.00406	0.01096
18	Moat Farm	465851	386645	0.00289	0.04624	0.00428	0.01156
19	Torworth Grange	465970	386001	0.00275	0.04407	0.00408	0.01102
20	College Farm	466102	385473	0.00222	0.03547	0.00328	0.00887
Max				0.05341	0.85453	0.07904	0.21363

Scenario 1
units = ug/m3

Caulmert
engineering environmental planning

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