| **Tank** | **Materials present** | **Potential diffuse emission** | **Monitoring data** | **ORA / OMP Source significance**  | **Current mitigation of diffuse emissions** | **Candidate options**  | **Safety and operational considerations** | **Proposed next steps (staged)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Dewatering feed tank | Digested sludge (liquid) | Ammonia (ppm) | - 2.0 – 3.3[[1]](#footnote-1) | Treated sludge is considered to be a lower risk source than raw sludge. Monitoring undertaken at other YW AD sites indicates that odour emissions are low.ORA classified this source as medium odour offensiveness and medium source odour potential | Mixing is used to:* promote aerobic conditions to inhibit methane generation.
* prevent settlement and reduce likelihood of septic conditions developing.

Operator control of tank mixing allows selection between continuous and intermittent operation. This allows the operator to manage the degree of mixing necessary to inhibit methane and septic conditions whilst avoiding unnecessary agitation of the tank contents reducing the dispersal of gases from tank head space.Sludge is digested for minimum of 12 days to break down volatile and organic solids, reducing potential for diffuse emissions from the resulting digestate.Sludge typically stored for no longer than 2 days before dewatering to reduce likelihood of septic conditions developing. | 1. Retain tank as per current configuration and operating profile 2. Modify tank (leaving uncovered). Options for consideration include: alteration of operating profile to target fixed level in tank, installation of inline H2S detection in tank headspace. 3. Cover tank and extract and treat e.g. via multi-stage OCU.  | Current tank configuration is operationally effective and avoids the creation of an ATEX zone which would require detailed design and assessment in order to safely manage the risk of methane build up and potential ignition. | 1. Carry out monitoring of tank headspace (odour, VOCs etc) to confirm the indicative data presented here. Method to be determined by monitoring specialist. 2. Review findings and submit interim report to EA, to include formal staging of any further activities (if required)3. If determined necessary by (2) carry out an engineering options appraisal including cost-benefit BAT assessment, supported by air dispersion modelling if required.  |
| H2S (ppm) | 0.002 – 0.0471 |
| Odour (ouΕ/m3) | 86 - 4871 |
| Total VOCs (ppm) | <0.1 – 0.51 |
| Centrate balance tank (CBT) | Liquor (centrate) generated from digested sludge dewatering is collected in the drains beneath the centrifuge platforms and directed to the CBT via a pumping station. The balance tank provides buffering capability prior to the reactor vessels. | Ammonia (ppm) | 0.5[[2]](#footnote-2) | Material derived from treated sludge, which is considered to be a lower risk source than raw sludge. Odour monitoring results indicate that odour emissions are low.ORA classified this source as medium odour offensiveness and medium source odour potential | Tank is mixed to ensure that centrate borne solids are kept evenly distributed and in suspension, this prevents blockages which could lead to overtopping, and also reduces the risk of material build up and septicity. The tank is equipped with an array of sensors to manage level control and overtopping or foaming over; this includes level switches and transmitters and foam radar. Outflow is provided with sulphuric acid dosing for pH control; this acts to provide good ‘whole system’ control by supporting the maintenance of a healthy biological population in the downstream LTP.Tank is designed to store no more than 24 hours of centrate, so liquor is always being passed forward and thus is fresh/non-septic. | 1. Retain tank as per current configuration and operating profile 2. Cover tank and extract and treat e.g. via multi-stage OCU. | Visual inspections of plant operations would not be possible. | No further mitigation proposed – emissions of key compounds demonstrated to be low. Retain tank as per current configuration and operating profile. |
| H2S (ppm) | 0.0112 |
| Odour (ouΕ/m3) | 3502 |
| Total VOCs (ppm) | 0.12 |
| Liquor treatment plant (LTP) primary settlement tank (PST) | Liquor flow from the centrate balance tanks. This is fed by gravity to the PST.Excess centrate solids. These are captured and settled out by the PST. The tank is equipped with a half bridge scraper and automatic de-scum facility. | Ammonia (ppm) | Not available | Material derived from treated sludge, which is considered to be a lower risk source than raw sludge. Odour monitoring results from other LTP sources suggest that odour emissions will be low.ORA classified this source as medium odour offensiveness and medium source odour potential | Materials comprise liquids derived from digested sludge (inherently lower odour generation potential). Solids and scum are automatically removed from the tank using scraper and transferred via de-sludge pumps thereby minimising diffuse emissions.The tank is equipped with an array of sensors to manage level control and overtopping or foaming over; this includes level switches and transmitters and foam radar.  | 1. Retain tank as per current configuration and operating profile 2. Cover tank and extract and treat e.g. via multi-stage OCU. | Visual inspections would not be possible increasing potential spill and odour risks associated with uncontrolled build up. | 1. Carry out monitoring of tank headspace (odour and speciated) to confirm that emissions are similar level to other LTP sources. Method to be determined by monitoring specialist 2. Review findings and submit interim report to EA, to include formal staging of further activities (if required)3. If determined necessary by (2) carry out an engineering options appraisal including cost-benefit BAT assessment, supported by air dispersion modelling if required. |
| H2S (ppm) | Not available |
| Odour (ouΕ/m3) | Not available |
| Total VOCs | Not available |
| LTP reactor vessels  | Liquor flow from the PST. Aeration is provided in the two reactors that have been seeded with anammox bacteria. The reactors provide treatment to reduce dissolved ammonia within the centrate. Liquors flow by gravity to the settlement tanks.  | Ammonia (ppm) | 3.02 | Material derived from treated sludge, which is considered to be a lower risk source than raw sludge. Odour monitoring results indicate that odour emissions are low.ORA classified this source as medium odour offensiveness and medium source odour potential | Tank is mixed to ensure that centrate borne solids are kept evenly distributed and in suspension, this prevents blockages which could lead to overtopping, and also reduces the risk of material build up and septicity. The tank is equipped with an array of sensors to manage level control and overtopping or foaming over; this includes level switches and transmitters and foam radar. Reactors are continually monitored to ensure a healthy bacterial population is maintained and that the processes is operating efficiently and effectively. | 1. Retain tank as per current configuration and operating profile 2. Cover tank and extract and treat via multi-stage OCU. | Visual inspections of plant operations would not be possible. | No further mitigation proposed – emissions of key compounds demonstrated to be low. Retain tank as per current configuration and operating profile. |
| H2S (ppm) | 0.0122 |
| Odour (ouΕ/m3) | 3482 |
| Total VOCs | 0.42 |
| Settlement tanks (post reactor) | LTP-treated effluent. The liquor leaves the reactor vessels and flows by gravity to the two settlement tanks. Sludge from the settlement tanks is returned to the reactors. Surplus sludge and treated effluent are discharged to the return pumping station and pumped back to Knostrop WwTW. | Ammonia (ppm) | Not available | Material derived from treated sludge, which is considered to be a lower risk source than raw sludge. Odour monitoring results from other LTP sources suggest that odour emissions will be low.ORA classified this source as medium odour offensiveness and medium source odour potential | Treated effluent from each reactor flows under gravity. Materials comprise liquids derived from digested sludge (inherently lower odour generation potential) which has been further treated to reduce ammonia.The tank is equipped with an array of sensors to manage level control and overtopping or foaming over; this includes level switches and transmitters and foam radar.  | 1. Retain tank as per current configuration and operating profile 2. Cover tank and extract and treat via multi-stage OCU. | Visual inspections of plant operations would not be possible. | 1. Carry out monitoring of tank headspace (odour and speciated) to confirm that emissions are similar level to other LTP sources. Method to be determined by monitoring specialist 2. Review findings and submit interim report to EA, to include formal staging of further activities (if required)3. If determined necessary by (2) carry out an engineering options appraisal including cost-benefit BAT assessment, supported by air dispersion modelling if required. |
| H2S (ppm) | Not available |
| Odour (ouΕ/m3) | Not available |
| Total VOCs | Not available |

1. No monitoring has been undertaken at this location at Knostrop. Data range presented is taken from monitoring of emissions from dewatering feed tanks at other comparable YW AD sites (Lundwood, Woodhouse Mill, Mitchell Laithes, Old Whittington, Sandall and Calder Vale). [↑](#footnote-ref-1)
2. Data taken from average of 4 samples taken at Knostrop STF on 26th May and 3rd June 2021. [↑](#footnote-ref-2)