Asset Management
Asset Standard
Odour Management Plan

Banbury STW

BANBS1ZZ

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Owner Review Requirements

Document to be reviewed when any changes are made to the site or processes

Local Review Requirements

Site Manager should be informed when handwritten amendments are made to this document

Revision No	Reason for Revision	Prepared by	Approved by	Date
1	Creation of OMP in new standard format	[redacted]	[redacted]	April 2014
2	New Performance Manger and review of OMP			November 2017
2.1	Update from audit actions			February 2018
3.0	New performance manager and OCU replacement and refurbishment			April 2019
4	IED permit application			October 2021

4.1	IED AD application resubmission	[redacted]	May 2023

0.2 Sign Off

Area Operations Manager	[redacted]	Date: May 2023
Performance Manager		Date: May 2023

0.3 Glossary of Terms

TERM	DESCRIPTION
AD	Anaerobic Digestion
BNR	Biological Nutrient Removal
CHP	Combined Heat and Power
CSM	Customer and Stakeholder manager
DEFRA	Department for Environment, Food and Rural Affairs
DWF	Dry weather flow
EA	Environment Agency
EHO	Environmental Health Officer
EMS	Environmental Management System
EDM	Event duration monitor
EPR	Environmental Permitting Regulations
FTFT	Flow to Full Treatment
H4	Environment Agency - How to comply with your permit – H4 Odour Management, March 2011
ICA	Instrumentation Control & Automation
IED	Industrial Emissions Directive
OCU	Odour Control Unit
OMC	Operational Management Centre
OMP	Odour Management Plan
PFT	Picket Fence Thickener
PM	Performance Manager
PS	Pumping Station
PST	Primary Settlement Tank
Receptors	Sensitive receptors are any fixed buildings or installations where odour annoyance may occur, such as residential homes, schools, hospital, offices, shops or garden centres. Open areas such as playgrounds and

	public footpaths should also be listed where these are known to have been affected by odour.
SAP	Thames Water's enterprise resource and planning system
SCADA	Supervisory Control And Data Acquisition
SOM	Site Operating Manual
SPS	Sewage Pumping Station
STW	Sewage Treatment Works
TCM	Technically Competent Manager
TM	Team Manager
UWWTD	Urban Waste Water Treatment Directive

1 Introduction

This Odour Management Plan (OMP) forms part of Banbury STW Best Operating Practice and is a constituent part of the Environmental Management System (EMS). A key related document is the Site Operating Manual (SOM) – this document can be found as a hard copy in the Banbury STW administration building and on Thames Water's database SharePoint, within the EMS pages.

The purpose of this OMP is to define how the potential and actual sources of odour from Banbury STW are identified, and how, as far as is reasonably practicable, they are controlled and recorded. It is primarily a management guide; detailed operational procedures are contained within the SOM.

Changes to OMP procedures are captured in the SOM as part of the periodic reviews of this document.

The effectiveness of the odour control measures will be reviewed annually or sooner if any of the following occur:

- If the site in question acquires any other permitted activity with the potential to increase the risk of odour off site.
- When significant changes are made to the site which may affect odour, e.g. capital spend.
- As a result of a change in pattern of odour complaints, increase in public concern and as soon as possible after a significant incident.
- When the site management change.
- If there is a material change in relevant regulations or guidance.
- If there is an odour release incident.
- If a contingency measure is triggered.

This OMP is an operational document that has been developed following a review of the potential risk areas for odour release. It details operational and control measures appropriate to the reduction or elimination of the impact of odours from wastewater treatment works. It provides detail to allow operators and maintenance staff to understand the operational procedures for both normal and abnormal conditions.

This OMP was updated in 2021 to incorporate appropriate odour control measures for activities that will be newly regulated under an Environmental Permit issued under Environmental Permitting Regulations following the principles transposed through the Industrial Emissions Directive. This follows the reinterpretation of the Industrial Emissions Directive in exclusion of UWWTD activities - meaning that anaerobic digestion on a Sewage Treatment works now needs an Environmental permit.

The Odour Management plan has been structured to distinguish between the two regulatory regimes, which are fully described in the Site Information chapter. The wastewater treatment process is covered by the Urban Wastewater Treatment Directive (UWWTD). The Environmental Permit for the Sludge Treatment Centre (STC) covers various process including but not limited to, anaerobic digestion process, combustion of biogas in the CHP plant and the storage of resulting sludge. This OMP responds to odour risks from both UWWTD and STC processes (referred to as the Sludge Treatment Centre Permit).

This OMP is stored electronically on SharePoint within the EMS page. A hard copy is kept on site within the Site Operating Manual in the SCADA room on site

1.1 Relevant Guidance

Where this Odour Management Plan relates to STW activities regulated under the Urban Waste Water Treatment Directive (UWWTD) this OMP may still draw upon elements of best practice taken from H4 but this should not be inferred as H4 being applicable to this location.

The following guidance has been used to inform the contents of the OMP where it relates to activities regulated under EPR through Sludge Treatment Centre Permit. This guidance does not apply to UWWTD activities:

- Environment Agency - How to comply with your permit – H4 Odour Management', March 2011 (H4)
- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (Waste Treatment BAT Conclusions)
- Environment Agency, Appropriate measures for the biological treatment of waste, Consultation draft July 2020.

The OMP format used is in line with that adopted for other Thames Water sites.

2 Site Information

2.1 Location and Receptors

Site Address:

Banbury STW
Thorpe Mead
Thorpe Industrial Estate
Banbury
Oxfordshire
OX16 4RZ
What 3 words ref: owls.calculating.price
EPR Permit number to be included when issued

Banbury STW serves the town of Banbury, along with the villages of Bodicote & Adderbury, Duns Tew and Deddington.

The works is located towards the south east of the town and is accessed from the Thorpe Industrial Estate. To the east of the site is a Balancing Pond for the M40 which has become a recreational area for fishermen, birdwatchers and walkers. Immediately to the north is an area for further expansion of the industrial area to the east. Beyond this area is where the residential estates are located. An area to the south west beyond the railway, known as Bankside, is being developed for residential use.

(For Site Location Map see Appendix 4 – Site Drawings)

Receptors

The nearest Receptors are given in Table 2.1 and have been marked on site location map in figure A Appendix 4:

Table 2.1 – Location of potentially sensitive odour receptors

Receptor Number	Receptor Address	Receptor Type	Approximate distance to the nearest site boundary (m)	Direction from the site.	Receptor Sensitivity
1	Thorpe Mead and Thorpe Way	Industrial	At boundary	North	Medium
2	Chalker Way	Commercial	At boundary	East and South East	Medium
3	Grundon Waste Management	Waste Management	At boundary	West	Low
4	M40 balancing pond	Recreational	At boundary	North	Medium
5	Padbury drive playground and football pitch	Open Space	170	West	Low

6	Residential areas surrounding Middleton Road	Residential	250	North and North West	High
7	Banbury united football club	Recreational	400	West	Medium
8	Bankside Park	Open space	500	South West	Low
9	Dashwood Banbury Academy	School	525	North West	High
10	St Leonards C of E Primary School	School	600	North	High
11	Bankside	Residential	600	South West	High
12	Banbury Madni Masjid	Place of Worship	670	North West	Medium
13	Banbury Station	Train station	750	North West	Medium
14	Causeway open space	Open space	750	North West	Low
15	St Leonards Church	Place of worship	900	North West	Medium
16	The New Foscote hospital	Hospital	900	West	High
17	Morrisons	Commercial	900	West	Medium
18	St Louis Meadow Park	Open Space	900	South West	Low
19	Overthorpe road	Residential	1000	Northeast	High

20	St Johns RS Primary School	School	1000	South West	High
21	The church of Jesus Christ Latter day saints	Place of worship	1000	South West	Medium
22	Commercial properties surrounding George Street and High Street	Commercial and residential	1000	North West	High
23	Moorfield Park	Open space	1100	North West	Low
24	Banbury Lane	Residential	1100	North East	High
25	Castle Quay Shopping centre	Commercial	1100	North West	Medium
26	Spice Ball Park Road	Commercial and recreational	1100	North West	Medium
27	Horton general hospital and Cherwell Hospital	Hospital	1200	West	High
28	Sainsbury	Commercial	1200	South West	Medium
29	The Grange Community Primary school	School	1200	South West	High

30	Premier Inn M40 J11	Commercial	1350	North	High
31	Banbury twenty cricket club	Recreational	1350	North	Medium
32	Premier inn Banbury town centre	Commercial	1400	North west	High
33	Spice ball country park	Open Space	1400	North West	Low
34	Longford Park road	Residential	1450	South	High
35	Wildmere Road industrial estate	Industrial	1500	North	Medium
36	Dove House	Residential	1500	East	High
37	Banbury tennis and Banbury central bowling club	Recreational	1500	West	Medium
38	Easington Park	Open Space	1500	West	Low
39	Harriers Banbury Academy	School	1500	West	High
40	Residential properties surrounding B4035	Residential	1500	West and North West	High
41	St Mary Church	Place of worship	1550	East	Medium

42	The Granary and The Courtyard, Warkworth	Commercial	1600	East	Medium
43	Peoples Park; Peoples Church	Open space and place of worship	1600	West	Low
44	Longford Park primary school	School	1650	South	High
45	Warkworth hall farm	Farm	1700	East	High
46	Blessed George Napier School	School	1700	South West	High
47	Warkworth Grange	Residential	1750	East	High
48	Carrdus School	School	1750	North East	High
49	Banbury Easington Allotments	Recreational	1750	West	Medium
50	Longford park community centre	Recreational	1800	South	Medium
51	Bishop Loveday C of E primary school	School	1800	South West	High
52	Banbury and Bicester College; Meadow Park College	School	1800	North West	High
53	Banbury gateway shopping park	Commercial	1850	North	Medium

54	Overthrope preparatory school	School	1900	North East	High
55	Southam Road	Industrial and commercial	1900	North West	Medium
56	Banbury country cricket ground	Recreational	2000	South West	Medium
57	Banbury Academy	School	2000	South west	High
58	Wykham Park Academy	School	2000	South west	High
59	Oxford canal	Recreational	500m	South	Low
60	St Marys Church	Place of Worship	1500	North West	Medium
61	St John the Evangelist Church	Place of Worship	1450	West	Medium

2.2 Off-site sources of odour

The site has had few odour complaints over the years.

Grundons Waste Management Limited operate a waste management facility adjacent to the sewage treatment works. This has the potential to generate odour complaints. In 2018 an enclosed area was built, near to the inlet of the works, to mitigate odour generation.

An industrial concern processing farm materials located towards Kings Sutton has the potential to generate odour complaints.

Historically the sewage has had a smell associated with the coffee processed in the town.

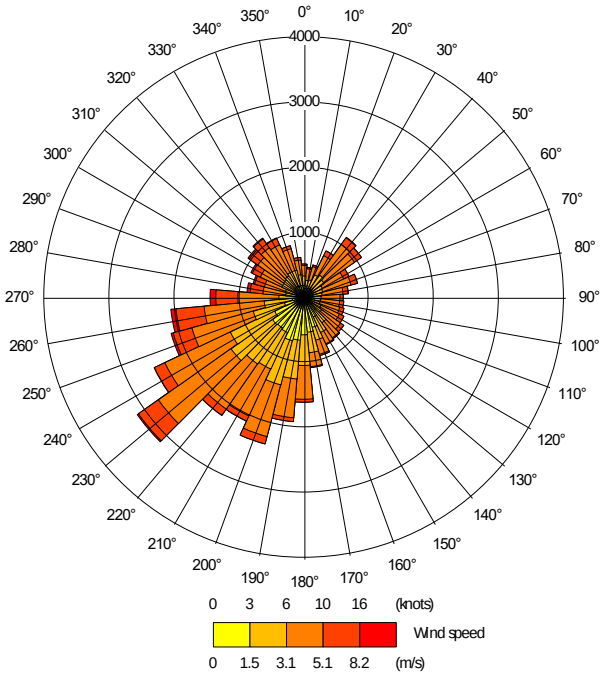
Odours can be generated upstream of the Southam Road Sewage Pumping Station; these are not detected on site.

2.3 Wind Rose and Weather Monitoring

Church Lawford meteorological station (approximate location NGR E 445449 N 274541) is located approximately 34.3 km north-northwest of the site and is considered the closest most representative meteorological monitoring station to the site. Data is recorded at the meteorological station in hourly measurements and the figure below presents the relationship between the frequency and speed of wind from compass point directions for the combined years 2016 – 2020. The figure illustrates the

predominant wind direction to be southwesterly, which means receptors northeast of the site would have the highest probability of experiencing potential increases in odour emissions.

Figure 2.31: Church Lawford meteorological station 2016-2020



There is no on-site weather station at Banbury. Weather on site can be reviewed if complaints are received or during periods of abnormal operations. The internal 'Weather' SharePoint site provides adverse weather information, and the UK Met Office website can also be used.

2.4 Site Layout and Treatment Processes

For site plans, see appendix 4. Further details of the site layout and treatment processes are given in the following sections of the Site Operating Manual and are therefore only given summary attention in this OMP:

Section	Description
1	Governance & Control
2	Location, key layout plans and diagrams. Site services, including power, water, drainage, SCADA and ICA. Consent details, process overview, chemical and waste handling.
3	Detailed description of each treatment process, including sludge and odour control.
4	Maintenance
5	Plant control, monitoring, and logging.

2.5 2.5 Process Description

2.5.1 **UWWTD activities**

Preliminary Treatment

- Flow is received at the inlet works from 3 terminal SPSs (sewage pumping stations) which collect flow from a further 25 SPSs. There are a number of new SPS serving new developments which are pending adoption.
- Flow passes through four 6mm step screens, with the screenings passing to two Mega-washer dewatering units and into skips.
- An overflow bypass channel allows excessive storm flow to bypass the screens.
- New Grit removal system installed April 2019.
- Flow up to 3 DWF passes to primary treatment via one measuring flume.

Storm Water Management

- Flow greater than 3 DWF passes through the other flume to the 10 sequentially filled storm tanks. Currently using 5 of the 10 tanks.
- Flow is discharged from the tanks through a Copatrawl. These are replaced and disposed of off-site when required.
- EDM installed on storm tank.

Primary Treatment

- Flow passes via a common feed chamber to four circular PSTs (primary settlement tanks).
- Flow from the Storm Return, Recirculation, Return Liquor and Decant SPSs also discharge to the common feed chamber.
- The PSTs are desludged by two “Willett” pumps to two PFTs (picket fence thickeners).

Secondary Treatment

- Settled sewage flows to four, three-lane, diffused air, plug-flow, activated sludge tanks.
- Ferrous chloride is dosed to the inlet of the plant to remove phosphorus.
- Each tank has an anoxic zone with submerged mixers.
- Aeration, by four variable speed blowers, is controlled by averaging DO (dissolved oxygen) probe readings across the four lanes.
- Flow passes to four FSTs (final settlement tanks) via a common feed chamber.
- RAS (return activated sludge) is pumped from the RAS well to the inlet of the plant to mix with settled sewage.
- SAS (surplus activated sludge) is pumped from the RAS well to two Aquabelts for thickening prior to digestion.

Tertiary Treatment

- Effluent from the FSTs flows to six rapid gravity sand filters.
- Solids backwashed from the filters are pumped to the activated sludge plant inlet.

Final Effluent

- Flow passes through a flume to record the flow treated for reporting purposes.
- Two on-line monitors, pHOX and S::SCAN measure the ammonia in the FE. The latter also measures suspended solids.
- Flow is discharged to the River Cherwell.

2.5.2 2.5.2 Sludge Treatment Centre Permit Activities

All aspects of the biological treatment of waste at the site, from the separation of sludge from the main aerobic treatment flow, thickening of sludge and blending with imported waste of a similar nature to indigenous sludge, anaerobic digestion, through to the storage of digested sludge cake prior to recovery to land offsite, including biogas storage and utilisation will fall within the scope of EPR.

The STC treats both indigenous sludges and imported sludges. Indigenous sludge is generated from the incoming flow to the STW, which passes to the primary settlement tanks and through the aerobic treatment process under the UWWTD. Indigenous sludges derived from the main flow are then subject to sludge thickening processes and transferred to the Sludge Blending Tank. Imports of sludge from other works are delivered to a sludge offloading point, is screened and pumped to the Sludge Blending Tank. All such imports are subject to appropriate waste pre-acceptance and acceptance checks, prior to import. This part of the process is subject to odour control via an odour control unit (OCU). Indigenous and imported sludge combine in the Sludge Blending Tank and are pumped to the Sludge Buffer Tank.

There is a second offloading point at the STC for imported waste close to the works inlet of the sewage treatment works. Wastes, consisting of cess, septic tank and similar sewage related wastes, are imported via tanker to the head of the works / works inlet for treatment through the aerobic treatment at the works, routed via the UWWTD assets.. Wastes arrive at the site via tanker vehicles.

From the sludge buffer tank, mixed sludge is pumped to one of the four primary anerobic digesters at the site. These above ground tanks are of glass coated steel construction with external insulation, fitted with roof mounted pressure relief valves.

Following treatment over an appropriate number of days within the primary digester tanks, sludge is transferred to one of three, open topped, above ground secondary digester tanks located at the site. Digested sludge is held in these tanks for an appropriate retention time to ensure that the required level of pathogen kill is achieved and in order to comply with the digested sludge cake output quality regulations.

Digested sludge is then transferred to the enclosed digested sludge dewatering plant, where digested sludge is subject to dewatering and conveyed to the cake drop zonedirectly outside the dewatering building. Digested sludge cake is subject to transfer to a larger storage area on the cake pad for storage prior to removal from site under the Sludge Use in Agriculture Regulations 1989, and in accordance with the Biosolids Assurance Scheme (BAS). Dewatering Liquors are returned via the site drainage system to the works inlet.

Biogas from the primary digesters is captured and transferred to a double membrane gas holder for storage. The biogas transfer pipeline is equipped with condensate pots that capture entrained moisture from the generated biogas and allow it to be drained into the site drainage system for treatment. The biogas storage holder and primary digester tanks are fitted with pressure release valves as a safety precaution in the event of over pressurising the system.

The biogas is taken from the biogas holder for combustion in a CHP engine, generating electricity for use within the site or export to the grid, and heat to maintain primary digester temperature. This is classified as an ‘existing’ combustion plant under the Medium Combustion Plant Directive. In the event that additional heating is required for the primary digesters, biogas may be used in the onsite boilers to provide heat to the digesters which are dual fuelled with natural gas. In the event there is excess biogas, i.e. more than the CHP or boilers can utilise, or in the event that the CHP is unavailable, there is a ground mounted emergency flare.

Thames Water imports treated sludge cake from other works, for temporary storage on the site cake pad, pending offsite recovery. Cake is offloaded into a bay, and visually checked. The waste stream is the same as that arising from the treatment of sludge within the Banbury STC with the same characteristics, composition and eventual end use - application to land. As such, the infrastructure which is acceptable for use for site cake is appropriate for the imported material.

All imported cake is stored on an impermeable cake pad, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

Key areas:

Cess Reception

- Tankered trade waste is received from third parties in the cess reception area.

Sludge Reception & Thickening

- The works receives sludge tankers from the satellite sites in the Banbury area (closed loop) (about 60 tankers per week) including thickened SAS from Chacombe STW. The latter is discharged into the aeration lanes.
- The imported sludge is screened by two Rotamats into the Sludge blending tank.
- Thickened sludge from the two PFTs is pumped to the Sludge blending tank.
- SAS from the FSTs is thickened by two Aquabelts then is pumped (no 1), gravitates (no 2) to the Sludge blending tank.
- Sludge is pumped from the Sludge blending tank to the Buffer Tank.

Sludge Treatment

- Sludge is treated in four mesophilic anaerobic digesters.
- Each digester is fed by a dedicated pump from the Blending Tank.
- Heating is by hot water from the CHP (combined heat & power unit) or boilers via spiral flow heat exchangers.
- Digesters 1 – 3 are gas mixed, digester 4 is paddle mixed.

Sludge Dewatering

- Digesting sludge is displaced to three open secondary digesters that operate on an automated batch sequence. Mixing is provided by mechanical mixers.
- Digested sludge is then pumped to the two Klampresses for dewatering.
- If issues with odour consider communication with neighbours and / or temporary spray bars. Liaision with Bio-recycling team to remove the excess cake to reduce the odours.

Biogas Storage, Handling & Utilisation

- Biogas from digestion is stored in a gas bag and is utilised in the CHP or the three boilers.
- The CHP produces electrical power that is exported to the area electrical distribution system.
- The boilers can operate on either biogas or natural gas.
- If there is insufficient plant to utilise the gas, it is burnt in the flare stack

Odour Control

- There are two Odour control units at site, OCU 1 (A13) serving imported sludge reception tank, rotamats, buffer tank and sludge blending tankand OCU 2 (A14) serves the two PFTs. Both replaced or refurbished end November 2018.

3 Site Management Responsibilities and Procedures

3.1 Site Roles

Figure 3.1 - Site Roles

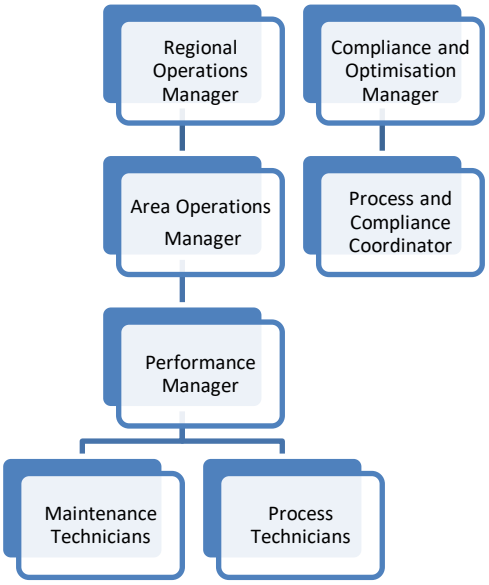


Table 3.1 - Tasks and Responsibilities

Role	Tasks and Responsibilities
Regional Operations Manager	Responsible for the overall performance of the STW's in the region.
Area Operations Manager	Responsible for the overall performance of the STW's in the area, and updating the OMP as it is implemented
Performance Manager	Responsible for overall performance of the STW and will be responsible for • odour control and management at the site • day to day implementation of the OMP • assessing the scope of, and updating, the OMP as it is implemented. • dealing with customer complaints • day-to-day operation of the STW • ensuring Thames Water staff undergo appropriate training
Technically Competent Manager	Hold the required WAMITAB qualification to support the activities on site under EPR, ensuring permit conditions are complied with.
Maintenance and process technicians	Day to day duties include maintaining and operating process equipment.
Customer & Stakeholder Manager (CSM)	Responsible for managing liaison with all external customers and stakeholders in liaison with customer centre, escalation team, local government team etc.
Compliance & optimisation manager	Responsible for process investigations and technical assistance.

Role	Tasks and Responsibilities
Process Compliance Coordinator	Reports to Compliance & Optimisation Manager. Responsible for process monitoring, improvement and troubleshooting.
Duty Manager	The duty manager is centrally based (off-site) and is responsible for event management across the business.
Customer Centre	Responsible for receiving all customer calls, logging them and passing them to the appropriate operational departments.

The site operates 24hrs per day and is manned from 7:30am – 3:30pm on a normal working day and can be attended by standby staff out of working hours.

3.2 Key Contacts

Thames Water Website – www.thameswater.co.uk

Role	Name	Email address	Phone Number
Area Operations Manager	Wayne Fraser	wayne.fraser@thameswater.co.uk	07747641243
Performance Manager	[redacted]		
Technically Competent Manager			
Customer Centre	Banbury STW	customer.feedback@thameswater.co.uk	0800 316 9800

3.3 Operator Training

Staff working on site undergo a site induction that is carried out by the Performance Manager. The site induction includes direction to the presence and location of the various operational procedures which include the SOM and the OMP. In addition, Site Tech 1's undergo a specific programme of training which covers management of activities on site.

All training records are currently held on Learning on Tap where they are accessible by the site Performance Manager and individual members of staff.

4 Odour Critical Plant Operation, Monitoring and Management Procedures

Odour prevention and reduction is achieved at Banbury through at least an annual review, or sooner as mentioned in Section 1, of the Odour Risk Assessment, Odour Improvement Plan and Odour Management Plan. In combination with the maintenance and monitoring carried out on site mentioned in sections 4 and 5.

Through our Odour Management Plans and maintenance procedures, the primary focus is on effective process control to minimise the risk of off-site odour nuisance. Similarly, our site-based frontline Wastewater Treatment Operations team are focussed on effectively managing the on-site process.

4.1 On Site Odour Sources, Critical Issues and History

Since the OCUs were installed in 2018 there have been no substantiated complaints. It is noted that there are potential for reports of odour that are not attributable to the site (see section 2.2).

An Odour Risk Assessment has been carried out on this site; this is included as Appendix 1 of this document.

An Odour Improvement Plan is included as Appendix 2.

Critical Odour Issues, Emergency Response and Mitigation Measures are summarised in Tables 4.3 to 4.7

4.2 Identification of Odour Critical Plant

4.2.1 Odour Risk Assessment

An Odour Risk Assessment has been carried out and a copy is included in Appendix 1. The Odour Risk Assessment is not a 'one-off' exercise but an on-going process.

It is constructed in the following manner:

- Each part of the treatment process is considered under different operating modes – e.g. normal, failure, abnormal: system overload, summer conditions, maintenance etc.
- The nearest customers to the particular odour source are identified.
- The likely frequency and duration of occurrence for each eventuality is identified.
- A score is assigned to the severity (0 – 5) of odour under each operating mode.
- A score is assigned to the probability (0 – 5) of causing an odour nuisance for each operating mode.
- Multiplying the severity of odour and probability of causing an odour nuisance generates a 'Current Odour Emission Risk' score. Between 0 (zero risk) and 25 (maximum risk), this is used to decide where mitigation should be applied in the short term, and determine where in the longer term enhanced improvement measures are required. Where improvements are identified as necessary (i.e. where suitable mitigation measures are not already in place), entries are made onto the Odour Improvement Plan. The need for operational mitigation, enhanced measures and customer communication is stated and brief details given.

Items scored in the Odour Risk Assessment with a risk score greater than 10, are classified as Odour Critical Plant, and where existing operational mitigation measures are not sufficiently robust, will have Improvement Plans generated to address the odour issues. The Odour Improvement Plan for Banbury STW is included in Appendix 2.

4.2.2 Potential Odour sources

The following list of potential UWWTD odour sources been identified during the risk assessment:

- Incoming sewers & reception wet well
- Cess Reception discharge, wash down and drainage
- Storm and balancing tanks
- Screens & screening, conditioning, Drainage & RAG Skip management
- Grit removal
- Primary settlement tanks
- Fats, oil & grease removal system
- Primary raw desludge pumping
- Activated sludge plant lanes and zones
- Final settlement tanks
- Scum removal system
- RAS chamber & pumping
- SAS chamber and pumping

The following list of potential odour sources under EPR has been identified during the risk assessment:

- Cess reception, discharge, wash down and drainage
- Sludge reception, screening, washdown and drainage
- Skip management
- Primary raw sludge thickening & pumping
- SAS thickening and pumping
- Sludge blending and mixing
- Return liquors
- Digester feeding, mixing and discharge
- Secondary digestion, mixing and discharge
- Belt press
- Liquor return
- Cake pad and drainage
- Vehicle movements and wash down
- Biogas storage
- CHP
- Odour control units 1 and 2

4.2.3 Waste Storage for Sludge Treatment Centre Permit

Waste is not stored on site prior to treatment through the UWWTD or AD process. A list of the main tanks relating to the sludge treatment process and their associated volumes and retention times is shown below.

Table 4.0 Sludge Treatment Centre Permit Tank Inventory

Tank Purpose	Number	Operational Volume (m^3)	Construction	Average Retention Time
Sludge reception tank	1	157	Concrete	< 7 days
Picket fence thickener	2	110	Steel	< 24 hours
Sludge Blending tank	1	39	Concrete	<24 hours
Sludge buffer tank	1	100	Steel	< 24 hours
Primary digester	3	1,408	Steel	19-28 days
	1	1,367	Steel	OOS
Secondary digester	3	899	Steel	15 days
Digested Sludge Polymer Silo	1	25 tonne	Plastic	1-1.5 years

An inventory of potential odorous materials relating to the Sludge Treatment Centre Permit is shown in Table 4.1 below. Air Emission Points are listed, and the locations shown on the site plan in Figure C of Appendix 4.

Table 4.1 Odorous materials for Sludge Treatment Centre Permit

Odorous and potentially odorous material (any solid, liquid or gas)	Location of odorous materials on site	Maximum quantity on site at any given day	Maximum time held on site (hours or days)	EWC Codes	Type of Emission	Odour potential High Risk / Medium Risk / Low Risk
Cake (including imported cake)	Open Cake Pad	4000tonnes	60 days	19 06 06	Diffuse	Low
Biogas	Open top tanks (see entries to digesters)	N/A	Continuous operation	N/A	Diffuse	Low
	PRV/Whessoe valve releases; gas storage vessel; unburnt methane from CHP engine. See Emission Point Plan.	Gas holder capacity is 1125 m3	Continuous operation	N/A	Point Source	Low
Releases from OCUs	For OCUs 1 x 2 see detailed consideration in Section 5.1.2.	Variable throughput is specific to each OCU.	Continuous operation	N/A	Point Source	Low
Liquor	Site drainage	Liquor is continuously pumped to the head of the works	Continuous	16 10 02	Diffuse	Low
Primary Sludge	Picket fence thickeners; sludge blending tank;	Refer to Table 4.0 Site Tank Inventory	Refer to Table 4.0 Site Tank Inventory	19 08 05	Point source (see OCU entry)	Medium

Odorous and potentially odorous material (any solid, liquid or gas)	Location of odorous materials on site	Maximum quantity on site at any given day	Maximum time held on site (hours or days)	EWC Codes	Type of Emission	Odour potential High Risk / Medium Risk / Low Risk
	sludge buffer tank;					
Surplus activated sludge	SAS dewatering plant;	Refer to Table 4.0 Site Tank Inventory	Refer to Table 4.0 Site Tank Inventory	19 08 05	Diffuse	Low
	Sludge blending tank	Refer to Table 4.0 Site Tank Inventory	Refer to Table 4.0 Site Tank Inventory	19 08 05	Point source (see OCU entry)	Low
Secondary digested sludge	Digested sludge dewatering plant	Refer to Table 4.0 Site Tank Inventory	Refer to Table 4.0 Site Tank Inventory	19 08 05	Diffuse	Low
Imported sludge	Sludge reception tank; sludge blending tank	Refer to Table 4.0 Site Tank Inventory	Refer to Table 4.0 Site Tank Inventory	19 02 06 19 08 05	Point source (see OCU entry)	Low
Screening	Screens	4 Skips,	Skips emptied within 24 hours of contact to Biffa,	19 08 01	Diffuse	Low

Table 4.2 Odorous raw materials for Sludge Treatment Centre Permit

Raw Material	Odorous	Storage	Mitigation	Odour Risk
Digested Sludge Polymer FO4808XXR	Not odorous	25 tonnes stored within a polymer silo	Contained with lid	Low
SAS thickening belts polymer Flopam EM 640 HIB	Not odorous	5,000L in 1,000L IBCs on portable bund	Contained with lid	Low

Anti-foam Flofam H16	Not odorous	6 x20KG kegs, stored within a building on bund	Contained with lid	Low
Mobil Pegasus 605 Ultra	Petroleum	1,000 L stored in double skinned tanks	Contained with lid	Low
Shell Mysella S7 N Ultra	Petroleum	300 L clean oil stored in double skinned tanks. Waste oil 5,000L double skinned tank	Contained with lid	Low
Texaco Delo XLC Antifreeze/Coolant 40/60	Not odorous	2,000L stored in bunded IBC	Contained with lid	Low

Low odour raw materials are chosen for use, as far as practicable.

4.2.4 Odour Critical Plant

Following the Risk Assessment, the Odour control unit processes within the site are classified as odour critical plant.

- Odour Control units 1 and 2

Odour critical plant is equipment that may cause off-site odour if not operating correctly

4.3 Odour Control Measures

The SOM referred to above complies with Thames Water's Asset Standards – Operating Standards. It states the operational procedures to be followed in order to maintain and operate plant to agreed company standards. These standards include, where appropriate, procedures for ensuring that generation of odour is kept to a minimum. . Refer to risk assessment in Appendix 1 where these measures are summarised as "Normal Mitigations"

4.3.1 Odour Control Units

There are two Osil Lava Rock OCUs on site:

- OCU 1 (A13) this serves the Sludge Reception Tank and Screens and the Blending and buffer Tanks.
- OCU 2 (A14) this serves the two Picket Fence Thickeners.

4.3.2 Site Specific Measures and abnormal events

H4 has been used to guide the preparation of this OMP where it relates to activities regulated under the Sludge Treatment Centre Permit. As this guidance does not apply to UWWTD activities, where reference to H4 is made within this document this should not be inferred as H4 being applicable to

UWWTD activities. Specific tasks and measures taken in intermittent, abnormal, and emergency events associated with the control of odours at Banbury STW are summarised in the tables below:

The routine operational tasks carried out at Banbury STW to specifically mitigate against generation of odour are also listed in the tables below.

Tables 4.3-4.7 - Summary of Critical Odour Issues, Emergency Response and Mitigation Measures

The purpose of Table 4.3-4.7 shall be to identify site specific emergency response procedures and mitigation measures relating to site odour generation and release. They include:

- Generic odour issues and mitigation measures relating to site-specific process stages; and,
- Additional site-specific odour issues and mitigation measures associated with process stages identified under the site Odour Risk Assessment.

Daily and weekly Site Round and Sludge Round checks are also carried out on each part of the process to ensure correct operation, these are shown in Appendix 5 and 6.

Table 4.3: Summary of routine odour mitigation tasks for assets under UWWTD

Odour source	Specific odour management tasks	Responsibility	Monitoring	Monitoring Frequency	Trigger for Action	Remedial Action and Timescale
General	Ensure site is kept clean and tidy	Site Tech 1s Performance Manager	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible but no later than same day
	Any spillages to be cleaned up as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible but no later than same day
	Site odour acceptability	Site Tech 1s	Qualitative assessment	Daily	Elevated odour on site identified.	Reports to Performance Manager at team huddle/SAP Plus entry where corrective action identified. For a spillage; immediate/asap resolution
Cess Reception, Discharge, Wash down & Drainage Linked tasks specified in Section 2.1 of appendix 6	Wash down facilities available. All site drainage is pumped to head of works. Spill kits on site also. Can stop cess imports also. Ensure tanker coupled correctly.	Site Techs/PM	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible but no later than same day
Storm & Balancing Tanks Linked tasks specified in 2.6 if appendix 5	Regularly clean down when used. Clean down unit and manual cleans.	Site Techs/PM	Visual Inspection	As required	Storm tank usage or not clean	Clean manually
Screens & Screening ConditioningDrainage	Regularly clean down when used	Tech 1	Visual Inspection	As required	Spillage identified	Clean up as soon as possible but no later than same day

& Rag Skip Management Linked tasks specified in 2.3 of appendix 5	Ensure screenings washed and dewatered before discharge to skip	Site Tech 1s	Visual Inspection	Daily	Wash water system not operating correctly	Clean down equipment. Check for any blockages. Report to M&E team for support
	Any blockage to be cleared and service resumed as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Impaired screen functions for any reason	Attention to blocked screens is immediate/asap on detection since will have significant impact on subsequent process. Timescales of remedial tasks such as repairs to screen brushes would be 2 to 8 hours; full replacement over 6 weeks duration
	Ensure skips are covered and removed from site as soon as practicable. Full skips are not to be stored on site	Site Tech 1s	Visual Inspection	As required	Skip identified that is not covered or not watertight. Skips over two thirds full are always prioritised for emptying given potential for odour.	Covers to be fitted at point of identification. Full skips aim to be removed within 1 week by Biffa.

Grit Removal Equipment, Drainage & Grit Skip Management (Currently OOS) Linked tasks specified in section 2.5 of appendix 5	Skips removed regularly before full	Tech 1/ PM	Visual Inspection	As required	Skips over two thirds full are always prioritised for emptying given potential for odour.	Removal of grit removal skips follows approach for screenings (although odour potential can be proportionally less). Proactive interventions are also made earlier in the process, such as removal of grit build up in the inlet channels; attention to blockages in the wash water system; rag removal from baffles/mechanical equipment are regular tasks completed weekly.
Primary Settlement Tanks Linked tasks specified in section 3 of appendix 5	Regular site rounds to ensure tanks are operating correctly.	Tech 1s	Visual Inspection	Daily	Any damage to the scrapers, any alarms triggering	Manual desludge until scraper can be repaired by M&E or contractor
Fats, Oil & Grease Scum removal system	Regular site rounds	Tech 1	Visual Inspection	Daily	Traps identified as having cracks, breaks or blockages	Removal of accumulated material in traps to timescales as above.
Primary raw desludge pumping	Regular site rounds	Tech 1	Visual Inspection	Daily	Desludge not pumping efficently	T1 and M&E to resolve same day – could be diaphragm issue

Activated sludge plant lanes and zones Linked tasks specified in section 4.1 of appendix 5	Regular site rounds	Tech 1	Visual Inspection	Daily	Higher lane results – bubble pattern changing	Look to isolate if it's a single lane, drain down. Check blowers. Immediate same day resolve – if unable to PM to be informed and action plan.
Flow & distribution to secondary settlement	Regular site rounds	Tech 1	Visual Inspection	Daily	Uneven flow distribution	Check for blockages, inspect tanks and pipeline.
Final settlement tanks Linked tasks specified in Section 5 of appendix 5	Regular site rounds	Tech 1	Visual Inspection	Daily	High or abnormal blankets	If it's a single tank take out of service – drain down. Check pumps and resolve same day
Scum removal system	Regular site rounds	Tech 1	Visual Inspection	Daily	Site wide sum removal – if higher levels of scum being seen	Check all pumps, check the process and monitor to resolve the issue
RAS chambers and pumping	Regular site rounds	Tech 1	Visual Inspection	Daily	Pumps failed	Replace/repair the pump same day with M&E
SAS chambers and pumping	Regular site rounds	Tech 1	Visual Inspection	Daily	Pumps failed	Replace/repair the pump same day with M&E

Table 4.4: Summary of routine odour mitigation tasks for assets under Sludge treatment centre permit

Process Stage	**Odour and offensiveness L/M/H**	**Specific odour management tasks**	**Responsibility**	**Monitoring**	**Monitoring Frequency**	**Trigger for action**	**Remedial action & timescales**	**Odour risk if measures fail**

Cess Reception, discharge, wash down & drainage Linked tasks specified in section 2.1 of appendix 5	Sewage (L)	Wash down facilities available. All site drainage is pumped to head of works. Spill kits on site also. Can stop cess imports also. Ensure tanker coupled correctly	Tech 1s/ PM	Visual inspection	Daily	Tanker seen discharging in appropriate manner. Coupling method presents clear odour risk from loose/incomplete fitting and/or release of liquid. Stop tanking if risk identified on site. Spillage on site by a cess tanker	Stop operation and contact Commercial Waste Team. Clean up spillage no later than end of the day.	**Low**
Sludge Imports Linked tasks specified in section 1 and 2 of appendix 6	Raw Sludge (L)	Covered tank abated by OCU 1. Ensure tanker coupled correctly.	PM	SCADA	Continuous	Fault with Bauer connection point presenting risk of leaks; spills or accumulated debris	If simple issue such as a spill, clear immediately. Remedial actions/timescales similar to Cess logger. If Bauer connection damaged beyond repair close logger off & immediately alert sludge imports team. Close sludge imports to all.	Medium

Skip Management Linked tasks specified in Section 2.5 of appendix 5	Raw Sludge (L)	Regularly remove skips before they are full	Tech 1/PM	Visual Inspection	As required	Skips not being removed in line with our requests	Contact Biffa and chase why removals are not happening	Medium
SAS Thickening & Pumping	Earthy (L)	Daily wash down and inspections as defined in site round task spec	Tech 1/PM	Visual Inspection	Daily	Pumps failed	Replace/repair the pump same day with M&E	Low
Sludge Blending & Mixing Linked tasks specified in section 3 of appendix 6	Sludge (M)	Kept covered	Tech 1/PM	Visual Inspection	Daily	Spillage on site – higher results	Clean up spillage. Montior results – speak with process team	Medium
		Abated by OCU	Tech 1/PM	SCADA	Continuous	See above	See above	See above
Digester feeding and mixing & discharge Linked task specified inspection 6 of appendix 6	Sludge (L)	Site rounds	Tech 1s	Visual inspection	Daily	Digesters not feeding	Check all feed lines, Walk the process, Check SCADA.	Low
Secondary digestion, mixing & discharge Linked tasks specified in section 13 of appendix 6	Digested sludge (L)	Site rounds	Tech 1s	Visual inspection	Daily	Tanks full. Rag being seen	Isolate tank. Check the process for rag	Low

Belt presses Linked tasks specified in Section 12 of appendix 6 and 8.3 of appendix 5	Digested sludge (L)	Site rounds	Tech 1s	Visual inspection	Daily	Rag being seen Belt failing/tripping	Check alignment of belt on presses. Check oil levels.	Low
Cake pad & Drainage (imported cake)	Digested sludge (L)	Regular collection of cake for removal off site. Cake in storage forms a crust after a day or two reducing risk of odour. Odour prevented during handling by limited drop heights, tipper trucks deposit sludge onto pad from height of less than 2m. Pre-acceptance checks on incoming digested cake. No additional turning or handling during cake storage. If long-term storage was needed temporary covers would be considered. Recessed cake pad provides wind barrier.	Tech 1s/PM	Visual inspection	As required	Removals not taking place as per the bio recycling team	Chase the team – ask for updates	Medium

Cake Pad & Drainage Linked tasks specified in section 16 and 17 of appendix 6	Digested Sludge (L)	Odour prevented during handling by drop height of less than 2m. Regular collection of cake for removal from site. Cake in storage forms a crust after a day or two reducing risk of odour. No additional turning or handling during cake storage. If long-term storage was needed temporary covers would be considered. Recessed cake pad provides wind barrier.	Tech 1/PM	Visual Inspection	As required	Removals not taking place as per the bio recycling team	Chase the team – ask for updates	Medium
Primary Raw Sludge Thickening & Pumping	Strong sludge (M)	Monitor process and pump out to replenish the sludge condition.	Tech 1/PM	Visual Inspection	Continuous	Ragging up – pumping slow or stopped	Remove rag. Check the process and pumps.	Medium
		Abated by OCU	Tech 1/PM	SCADA	Continuous	See above	See above	See above
Vehicle Movements & Wash Down	Digested sludge (L)	Keep movements to a minimum and cover wagons	Sludge Management	Visual Inspection	As required	Contained in sludge imports or CESS imports see their notes	Contained in sludge imports or CESS imports see their notes	Medium
Biogas storage Linked task specified in section 8 of appendix 6	Biogas (L)	Site rounds	Tech !s	Visual inspection	Daily	Valves not closing correctly – any chattering being seen	Check all pipework and valves. Involve APD	Low

CHP Linked tasks specified in section 9 of appendix 6	Biogas (L)	Site rounds and PPM	Tech 1s and PM	Visual inspection	Daily	CHP engine turned off/failed	Contact CHP team to resolve	Medium
OCU 1 – sludge holding tanks Linked task specified in section 9 of appendix 5	Sludge (L)	Monthly service inspections and site rounds	Contractor ; Tech !s	Visual inspection	Monthly; Daily	Visual checks only – immediate report to contractor for any issues	Visual checks only – immediate report to contractor for any issues	High
OCU 2 – Picket fence thickeners Linked tasks specified in section 9 of appendix 5	Raw sludge (L)	Monthly service inspections and site rounds	Contractor; Tech 1s	Visual inspection	Monthly; Daily	Visual checks only – immediate report to contractor for any issues	Visual checks only – immediate report to contractor for any issues	High

Table 4.5: Intermittent, abnormal, and emergency events for assets under UWWTD

Process stage	**Event**	**Status**	**Ops mitigation**	**Expansion of TWUL operational response to odour under Int/Ab/E events**	**Odour risk after mitigation**
Cess Reception, Discharge, Wash down & Drainage	Blockage leading to spillage on surface	Ab	Stop discharge and clear	Close imports until fully clear	Low
Storm & Balancing Tanks	failure of clean down unit	Ab	mitigated with manual clean down. Root cause failure of unit and repair.	See previous tables	Low

Screens & Screening Conditioning, Drainage & Rag Skip Management	Breakdown, skips not emptied	Ab	Monitor and replace as required. If urgent removal required we action.	Contact Contracts Manager to escalate	Medium
Grit Removal Equipment, Drainage & Grit Skip Management (Currently OOS)	Skips not emptied	Ab	Call for skips to be changes	See above	Low
Primary Settlement Tanks	Pump or scraper failure, or downstream issues	Ab	Repair plant, empty tank, resolve issues downstream. Daily monitoring alarms daily blanket testing	Site can run on 3 tanks so 1 tank can be isolated. Immediate action required	Medium
Fats, Oil & Grease Scum Removal System	Blockages	Ab	Clear blockages	See previous table.	Low
Primary Raw Desludge Pumping	Blockages, plant failure	Ab	Clear blockages, repair plant	See previous table	Low
Activate sludge plant lanes & zones	Tank out for service	Ab	Seasonal considerations	Working alongside process team – see previous table	
Final Settlement Tanks	Bridge failure	Ab	Empty tank and repair	Site can run off 3 tanks, immediate action to get the tank back into service ASAP	Low
Scum Removal System	Build-up of scum	Ab	Remove scum, empty tank	Site can run off 3 tanks, immediate action to get the	Low

				tank back into service ASAP	
RAS Chambers & Pumping	Blockages, plant failure	Ab	Clear blockages, repair plant	See previous table	Low
SAS Chambers & Pumping	Blockages, plant failure, downstream problems.	Ab	Clear blockages, repair plant, resolve process issues.	See previous table	Low

Table 4.6: Intermittent, abnormal, and emergency events for assets under sludge treatment centre permit

Process stage	**Event**	**Status**	**Ops mitigation**	**Expansion of TWUL operational response to odour under Int/Ab//E events**	**Odour risk after mitigation**
Cess Reception, Discharge, Wash down & Drainage	Blockage leading to spillage on surface	Ab	Stop discharge and clear	See above – CESS would be closed immediately	Low
Sludge Reception, Screening, Wash down & Drainage	Exceptional load, downstream issues.	Ab	Closed imports.	Imports closed	Medium
	Spillage	Ab	Clean up ASAP	Imports closed	Medium
Skip Management	Skips not removed	Ab	Replace skips as emergency. Biffa agreement is 48hrs turn around	Involve contracts manager	Low
Primary Raw Sludge Thickening & Pumping	Blockages in or out, pump failures, PLC/control issues, downstream failures.	Int	Deal with issues, empty tanks. Ensure OCU is operational.	OCU to be checked by contractor if required	Medium

SAS Thickening & Pumping	Downstream issues	Ab	Deal with issues, stop imports.	Imports Closed	Low
	Pump failure or blockage	Ab	Identify root cause and recitify	M&E and T1 action immediate	
Sludge Blending & Mixing	Blockages, breakdowns, Downstream issues	Ab	Deal with issues, stop imports. Ensure OCU is operational.	OCU contractor inspection	Medium
Return Liquors	Pump failure, or overwhelmed.	Ab	Repair, overpump	M&E and T1 action immediate	Low
Digester Feeding, Mixing & Discharge	Blockages, downstream issues. Digester cleaning.	Ab	Deal with issues. Plan in a digester cleaning when appropriate.	Speak with SAT and APD	Low
Secondary digestion, mixing and discharge	Blockages, downstream issues. Digester cleaning	Ab	Drain down tank and clean. Rectify issues	M&E and T1 action immediate	Low
Beltpress	Blockage or plant breakdown. Impact on upstream processes	Ab	Repair, unblock	M&E and T1 action immediate	Low
Liquor Return	Blockages, plant failure	Ab	Repair, unblock	M&E and T1 action immediate	Low
Cake Pad & Drainage	Waterlogging, very hot conditions.	Ab	Bio recyling team monitor daily and remove loads as required. During inclement weather unloading of waste may be prohibited.	Biorecyclsying team to increase removals	Medium
Biogas Storage	Venting, damaged gas vessel, valve or pipework.	Ab	use flare stack.	M&E and T1 action immediate	Low
	Release of biogas from pressure release valves				
Vehicle movement and wash down	Movement of sludge and lorry loading	Planned	Covered wagons	LMC	Medium

				Sludge Imports and CESS imports monitoring	
CHP	Creating noxious fumes	Ab	CHP team monthly servicing and monitoring.	CHP team	Medium
Odour Control Packages	Failure of OCU	Ab	Daily task check and servicing monthly. Spray temp OCU as masking	Consider temporary odour suppressant sprays	High

Table 4.7: General Intermittent, abnormal, and emergency events

Incidents and emergencies	Event	Status	Ops mitigation	Expansion of TWUL operational response to odour under Int/Ab//E events	Odour risk after mitigation
Incidents and emergencies				**For all entries TWUL's incident management response process would be followed including use of Site Incident (SIC) cards.**	
Fire	Failure of fans or sludge building	E	Use of SHTs for storage of sludge. Tanker from site		Low/Medium
Severe weather	Transport of sludge from site inhibited resulting in back up of sludge in site resulting in additional odour release from tanks and PSTs	E	Event unlikely as there is provision for 70days storage on site plus additional storage in the existing sludge holding tanks		Low
Flooding	Flooding causing process or equipment problems	E	Not an identified problem at Banbury. Site incident procedures would be followed.		Low

Illness/absence of key staff	Accumulation of sludge/loss of odour control etc.	E	Task allocation is independent of individual staff.		Low
Power cuts	Loss of power to fans leading to loss of odour control	E	Emergency power generation for critical activities until power restored.	Incident Management. Site has 2 x standby generators both tested monthly and also black and brown starts as per the planned maintenance	Low
Other incidents	Transport of sludge to land inhibited for other reasons leading to back up of sludge in site resulting in additional odour release from tanks and PSTs	E	Provision for 70days storage on site plus additional storage in the existing sludge holding tanks. Transport to other STWs if necessary		Low

4.3.3 Spillage

Spillages significant enough to cause odorous emissions will be cleared as soon as practicable. The person discovering the spillage will inform site management, who will utilise resources as required to clear it.

Spill response guidance is also available in the Pollution Prevention Essential Standard at Environmental Management System - Pollution Prevention (sharepoint.com).

4.4 Routine Monitoring

Overall plant performance is assessed daily as part of the generic Site and Sludge Rounds, which apply to Thames Water large STW sites, and have been included in appendices 5 and 6, respectively.

The objective of these are to ensure that treatment processes, including odour control, are checked for effective operation as per the SOM. Any of the checks that result in performance of the process outside of the limits defined in the SOM or a fault being detected will require an Operator to change the process to bring the plant back into acceptable limits or the faults need to be logged and reported for follow up maintenance/repair. A daily check of site odour is also recorded in the E-Logbook.

Where remedial actions are identified from any source these are listed in Tables 4.3 & 4.4 with expected durations accompanying rectification. The timescales given are indicative or illustrative but are informed directly by operational experience. Repairs requiring capital funding will take longer as they are directly informed by complexity and will be bespoke to the issue(s) identified.

Various process parameters are monitored using a combination of online instruments (to measure flows, temperatures, pressures, levels); samples that are taken to our UKCAS accredited laboratories, or run through sampling tests at the on-site laboratories (%DS, pH, alkalinity, ammonia).

The online instruments all have signals that are taken back to the site SCADA system and these ‘alarm’ if the readings are outside pre-set trigger points. Similarly, laboratory analysis samples will have expected ranges, which if outside of these, a notification is sent to the site process controllers.

In all instances that parameters are out of ‘range’, the operational teams will carry out an investigation to understand the cause and initiate corrective actions. If the reasons are not obvious, the process optimisation team is contacted to evaluate further.

Additionally, each week the various recorded parameters are recorded in the site Cockpit reports to look at trends. These are used to establish if there are gradual changes in performance over time so that early intervention can be carried out.

A range of process parameters are subject to routine monitoring or checking to ensure that the digestion process is operating optimally so that the required sewage cake output quality is achieved.

- pH: At a conventional digestion site such as Banbury the processes is maintained around pH 7 but within the range 6.72 – 7.6 (this is % dry solids and digester load dependant) for healthy operation.
- alkalinity: Levels dependant on feedstock characteristics (primary sludge: surplus activated sludge (SAS) ratio). Conventional digestion typically, 3,500 – 5,000mg/litre range.
- temperature: minimum target of 38°C. This is maintained within the range 36-40°C.

- HRT (hydraulic retention time): minimum target is 15-days, there is no upper limit. Retention times shall not be less than 12-days during plant outages to keep the product pathogen kill efficiency control.
- OLR (organic loading rate): see table below – this is dependent on the primary/SAS ratio. Banbury fits into the first row of the table.
- Dry solids feed: see table below, Banbury has a target of 6%DS, but this can vary between 3-8%DS and impacts the HRT.

Type of Digestion	0%- 35% SAS[x]	36%- 45% SAS	46%- 50% SAS	51%- 55% SAS	>55% SAS	Max Feed %DS
MAD* in Conventional Digestion	3	2.5	2	1.75	n/a	6
MAD after Pre-pasteurisation	4.5	4	3.5	3	n/a	7
MAD after Acid Hydrolysis	4.5	4	3.5	3	n/a	7
MAD after Thermal Hydrolysis	7	6.5	6	5.5	5.5	14

* mesophilic anaerobic digestion

[x] surplus activated sludge, arising from the UWWTD treatment route.

- VFA (volatile fatty acid) concentration: There is no specific range for VFAs as it depends on the feedstock. It is used as an indicator of digester health rather than a process control. The production of organic acids depends on the volume of solids fed to the digester. The typical range for VFAs in a Primary Digester Tank is between 50 and 800 mg/L. When VFA concentrations climb above 1000 mg/L, the digester could be overloaded or experiencing other problems.
- Ammonia – Ammonia concentrations of 50 to 1000 mg/L are beneficial, but ammonia levels of 1500 to 3000 mg/L (pH greater than 7.4) could be inhibitory but not always. An ammonia concentration higher than 3000 mg/L for prolonged period is toxic.
- VFA to Alkalinity ratio: Very important parameter to monitor for digestion process. The VFA to alkalinity ratio of below 0.4 is good and above this threshold value means diminishing alkalinity and low pH i.e. sour digester content. As long as this ratio is maintained higher VFA and alkalinity digester content can be acceptable and the digestion process is deemed healthy. Anaerobic digestion process is always controlled based on holistic parameters based but not based on single parameter.

Odour monitoring is carried out following receipt of an odour complaint. See section 6.3 Investigation a complaint for full details.

To ensure steady state monitoring is carried out and confirm that odour is under control Thames Water propose to develop a sniff testing procedure that will be put in place within 3 months of the permit being issued. This will allow time to carry out staff training and ensure that our systems are updated to include the monitoring requirement within site tasks and an ability to record the information obtained. An outline of the proposed procedure is below:

- Undertake a regular monthly sniff test off-site at locations both upwind and downwind of the site (locations would be subject to further assessment including location of receptors, patterns of complaints and weather conditions/wind direction). This will ideally be carried out by a member of staff who is not routinely based on site.
- Investigate whether it is possible to include sniff testing as part of our monthly OCU contractor visits if required.
- The content of the EA Odour Monitoring Form within the H4 guidance and the H4 methodology will be used to inform the procedure and the information shown in the form gathered as part of each monitoring round.
- Carry out additional sniff testing in between monthly checks, following the same methodology, if complaints are received or if there are events on site which mean there may be an increased odour risk off-site. This would again be carried out by a member of staff who is not routinely based on site.
- Information will be recorded via our electronic systems.
- Any off-site odour suspected to be from our site will be investigated and actioned accordingly.

We aim to ensure a robust process is in place for investigation of complaints involving non-site based staff (see Section 6 of the OMP). We also ensure regular routine maintenance is undertaken involving site walks to ensure more odorous activity is identified, captured, resolved and logged in the site log book.

Further details of routine monitoring tasks are included in the Site Operating Manual.

4.5 Record Keeping

Records of routine monitoring, site and sludge inspection rounds and sludge blanket checks are kept on SAP. Records of skip management, which collect wastes generated from UWWTD activities, and any spillages and remedial actions are held in the Elogbook. Sludge blanket levels are recorded on run charts and electronically via the Cockpit.

There is a SCADA system on this site.

A monthly condition report on the OCUs is sent to the performance manager by the contractor.

4.6 Emergency Response and Incident Response Procedures

Emergencies such as fire, flood and severe weather are managed by Thames Water's Business Resilience and Security team. The processes employed can be found on Thames Water's portal intranet site and are entitled: 'Security and Emergency Risk Management Process' and 'Event Management Procedure'. These are company confidential documents and therefore, are not included in the Appendices of this document.

Hazard reporting and accidents are all recorded on the Health and Safety software database SpheraCloud (https://sphera.com) and monitored by Thames Water's Health, Safety & Environment team.

In the event of power failure, the site will run on island mode for critical plant, however, this does not include the odour control units and there is a potential temporary risk of odour until power is restored.

Absence of key staff does not affect the running of Banbury STW, as Tech 1s from other sites can be called upon to cover, if required.

Tables 4.3 to 4.7 respond to the identification of relevant triggers and actions to minimize odour. OCU monitoring is also included. Monitoring of odour release to atmosphere for wider sludge treatment assets is constrained by sludge containment (say versus an open composting operation), the lack of a confined emission point and the episodic nature of odour release and exposure.

Irrespective of such constraints, our Operations Team and odour contractor have recommended consideration of the following techniques either proactively (so accompanying planned or reactive works with known odour risk) and in an investigative capacity attached to an incident:

(a)Targeted use of 'Jerome' hydrogen sulphide analysers (already present in Section 6.2 of OMP to investigate customer complaints).
(b)Targeted use of sniff tests ('calibrated nose')
(c)H2S measurements of stored materials where septicity is either present, or the material is at risk of septicity from continued storage especially in the open air, for example, prior to de-watering where measurements of sulphide & dissolved O2 would inform a condition assessment. Quantities and storage times precipitating a need for such assessments. This recommendation is being raised with the Area Process Scientist.
(d)Inclusion of temporary odour suppressants/misting agents (for example, where use is recommended in Table 4.6) and continued access to process critical spares (odour minimisation by early intervention).
(e)Further expansion of odour risk within site incident planning (this is already referenced in Tables 4.5, 4.6 & 4.7 under relevant Intermittent; Abnormal Operation & Emergency scenarios)
(f)Temperature assessment in secondary digestion tanks on the basis that increased temperatures give greater potential for volatilisation of odours
(g)For PSTs, asset condition (wear/damage) would consider odour risks where assets are taken offline
(h)Telemetry/alarming of whessoe valve releases – there is an existing phased project within TWUL to enhance this at our sludge locations.

5 Maintenance and Inspection of Plant and Processes

5.1 Routine Maintenance

5.1.1 General Requirements

Site staff have a schedule to ensure routine maintenance for key mechanical items. In addition, a dedicated maintenance team provide additional support for more specialised equipment, e.g. regular calibration of Dissolved Oxygen probes.

In addition to the routine operational tasks, planned preventative and defect maintenance of plant is carried out. Plant which may have an impact on odour release is assigned an appropriate criticality rating to ensure effective performance is maintained. Plant assessed to be odour critical is listed in Section 4.2.4 above.

All maintenance procedures are detailed in the SOM, and when carried out is captured on the corporate system SAP, which generates work requests for the various activities for the treatment process assets at the appropriate frequency

5.1.2 OCU Selection and performance validation

The introduction of new OCUs is informed by a bespoke design brief informed by calculations of the system's capacity, principally flow rate measured in Am3/hr. OCUs can either be direct installs or commissioned under joint venture arrangements where a component part of wider UWWTD/EPR asset replacement and/or refurbishment

Area Extracted	Extraction Rate	Ductwork Size	Velocity
Sludge Area OCU system	1,600 m^3/hr	250 dia	9.05m/s
PFT Tank OCU System	500 m^3/hr	160dia	7.46m/s
Equipment	**Size**	**Height**	**Media Volume**
LavaRok® Biofilter Sludge Area	2m Dia	2.75m	4.2m^3
LavaRok® Biofilter PFT Tanks	2.5m Dia	3.6m	13.3m^3
Fans	**Pressure**	**Drive Type**	**Impellor Speed**
Extraction Fan1 FMT250/225 Sludge Area	2000 Pa	Direct Drive	2800 rpm
Extraction Fan2 FMT160 PFT Tank	750 Pa	Direct Drive	2800 rpm
Fan Motors	**Size**	**Type**	**Supply**
Extraction Fans – Sludge Tank Area	2.2 kW	Class F IP55	400v/3ph/50hz
Extraction Fans – PFT Tanks	0.55 kW	Class F IP55	400v/3ph/50hz
Extraction Fans – Sludge Tank Area - FLC	4.4 amps	-	-
Extraction Fans – Sludge Tank Area - SC	27.5 amps	-	-
Extraction Fans – PFT Tanks – FLC	0.86 amps	-	-
Extraction Fans – PFT Tanks - SC	3.6 amps	-	
Drainage	**Flow Rate**	**Pressure**	**Size**
Fans	Condensate	Vacuum	25mm
Stack	Condensate	Gravity / Over Gully	25mm
Instrumentation	**Range**		
Differential Pressure Gauges (Magnehelic)	0 – 2.5 kpa		

Duty/standby fans are installed, only one fan should operate at a time.

An irrigation system is provided to maintain the required amount of moisture required to allow microbiological growth

Sludge OCU (OCU1) A13

Serves the sludge reception tank, screens and blending and buffer tanks, refurbished in 2018

Parameter	Value	Units
Total air extraction	1,600	M3/hr
Design temperature	5-40	C
Odour design average inlet H2S concentration	30-150	ppm
Odour design maximum inlet H2S concentration	150	ppm
Design back pressure across biofilter	<1.75	kPa
Design system H2S removal efficiency	99.5	%

Extraction points	Design H2S Concentration (ppm)	Ductwork diameter mm	Design flow Volume m3/h

Washpactor 1	10-50	110	100
Washpactor 2	10-50	110	100
Sludge blending tank 1	10-30	110	75
Sludge blending tank 2	10-30	100	75
Sludge buffer tank	30-150	200	944
Sludge reception point 1	30-150	110	102
Sludge reception point 2	30-150	110	102
Sludge reception point 3	30-150	110	102
Average H2S Concentration	30-150	Biofilter Inlet Total	1,600

The OSIL LavaRok PFT unit details are:
Sludge LavaRok dimensions: 1 unit 2.5m dia x 3.6 high
Sludge LavaRok media volume: 13.3 m3 of LavaRok media
Retention time: 30 seconds.

For periodic operational monitoring.

- Inlet and outlet Hydrogen Sulphide concentrations recorded and assessed for removal efficiency and below maximum designed inlet loading during monthly inspections. Following the monthly inspections, hydrogen sulphide concentrations are trended by ERG which would enable identification of a decrease in H_2S removal. Should this occur, ERG would include this in the 'R.A.G.' recommendation section of their inspection report, for example media replacement.
- System integrity checked during daily site rounds and monthly inspections to confirm extraction points and routes undamaged.

PFT OCU (OCU2) A14

Serves the Picket Fence Thickeners, refurbished in 2018

Parameter	Value	Units
Total air extraction	500	M3/hr
Picket Fence Thickener 1	250	M3/hr
Picket Fence Thickener 2	250	M3/hr
Design temperature	5-40	C
Odour design average inlet H2S concentration	30-150	ppm
Odour design maximum inlet H2S concentration	150	ppm
Design back pressure across Bioflter	<1.75	kPa
Design system H2S removal efficiency	99.5	%

The OSIL LavaRok PFT unit details are:

PFT LavaRok dimensions: 1 unit 2.0m dia x 2.75 high
PFT LavaRok media volume: 4.2 m3 of LavaRok media
Retention time: 30 seconds.
PFT thickener 1 ductwork diameter 110mm
PFT thickener 2 ductwork diameter 110mm

For periodic operational monitoring.

- Inlet and outlet Hydrogen Sulphide concentrations recorded and assessed for removal efficiency and below maximum designed inlet loading during monthly inspections. Following the monthly inspections, hydrogen sulphide concentrations are trended by ERG which would enable identification of a decrease in H_2S removal. Should this occur, ERG would include this in the 'R.A.G.' recommendation section of their inspection report, for example media replacement.
- System integrity checked during daily site rounds and monthly inspections to confirm extraction points and routes undamaged.

The equipment and loadings of OCU1/2 continue to meet the original design specifications with additional headroom for future additional processes, where identified. Unscheduled additions are avoided as these require a process re-evaluation to consider the impact on the OCUs. No such changes since the original installs have been undertaken. Evidence of the systems continuing ability to treat the input flow are confirmed by monthly inlet and outlet odorous gas (hydrogen sulphide) concentrations. Examples of such reductions are given in 5.1.3 iii) of the OMP

5.1.3 Maintenance of Odour Control Units

Operation and maintenance of OCUs is delivered in accordance with the Company's Asset Standards. This is either delivered in-house by Operations or outsourced to a specialist contractor. Refer to Odour Control Unit Asset Standard and Site Operating Manual. The scope of this table includes anticipated monitoring requirements of emissions to air from the OCU outlets; TWUL's own site round checks as they pertain to OCUs; followed by a further five key performance indicators reflecting discussion with our specialist OCU inspection contractor as of greatest relevance to Banbury.

Table 5.1 Summary of OCU Monitoring and Maintenance Checks

Parameter	Monitoring Method	Action if red flag identified and Expected timescales	Frequency	Biofilter	Carbon	Chemical scrubber
Performance monitoring						
Gas inlet temperature (5-40C)	Temperature probe	Investigate any anomalies relating to temperature, such as individual process checks	Monthly	X	X	X
Gas outlet temperature (5-40C)	Temperature probe	Investigate any anomalies relating to temperature, such as individual process checks				
Gas inlet flow rate or velocity (6m/sec)	Calibrated velocity meter	Investigate any anomalies relating to flow rates; velocities and pressure drop across the system by measuring the inlet and outlet pressure. Check fan functionality; presence of obstructions; bring forward contractor service. If fan replacement needed c. 2* months minimum typical duration depending on severity of issue/condition of back up fan (*time of order to mobilisation; assumes second duty fan runs; timescale includes time to install replacement and fabrication). If solely an electrical issue, recourse to TWUL ICA Technician mostly likely within a week. Other root causes are usually blocked media; duct and failure of non-return dampers around fan sets.	Monthly	X	X	X
Gas outlet flow rate or velocity (6m/sec)	Calibrated velocity meter					
Gas inlet humidity (Post biofilter humidification > 90% Carbon units <70%)	Hygrometer	Check any preheaters fitted to system before carbon, or check irrigation is working on biofilter.	Monthly	X	X	-
Back pressure (to assess media thatching or media compaction) Typically systems work around 0.5 kPA	Calibrated digital pressure meters	Values above threshold would be 'RAG' banded in the OCU contractor inspection reports. If pressure gauges are over-pressurised to the extent fouling is or has occurred to be treated as high priority. Check for blockages, poor FFE quality/check if media is of a type susceptible to biodegradation.	Monthly	X	X	X
pH of discharge irrigation water (2-3pH)	pH paper	Less than 2 increase irrigation.	Monthly	X	-	-

pH of scrubber liquor (9.2 pH)	Calibrated pH probe (calibrated with standard solutions)	Recalibrate pH probe and check dosing and chemical availability	Continuous	-	-	X
Redox potential of scrubber liquor (700-730 mV)	Calibrated redox probe (calibrated with standard solutions)	Recalibrate redox probe and check dosing and chemical availability	Continuous	-	-	X
Gas inlet/outlet concentrations for hydrogen sulphide (50ppb used for media change out)	Drager Tubes/CEN TS 13649 for sampling NIOSH 6013 for analysis OR US EPA M11	Check functionality of odour control unit. If repair or replacement media required raise a job on SAP or APS risk and arrange for contractor repair. Timescale Bespoke to root cause/see later entries. Arrange re-test post remedial work. Major repairs up to 6 months depending on complexity	Monthly/ 6 monthly	X	X	X
Gas inlet/outlet concentrations for ammonia (20mg/m3)	Drager Tubes/EN ISO 21877 OR CEN TS 1369 for sampling NIOSH 6016 for analysis	Check functionality of odour control unit. If repair or replacement media required raise a job on SAP or APS risk and arrange for contractor repair. Timescale Bespoke to root cause/see later entries. Arrange re-test post remedial work. Major repairs up to 6 months depending on complexity	Quarterly/ 6 monthly	X	X	X
Gas outlet streams TVOC and HCL	EN 12619 and EN 1911	6 monthly IF identified as relevant in waste gas stream characterisation				
Gas inlet/outlet concentrations VOCs and RSH	RSH – Drager tubes VOC – PID as isobutylene		Quarterly	x	x	x
Maintenance checks and inspections						
Check integrity of tank covers for damage and ensure access hatches are closed		Close hatches ASAP	Daily	X	X	X
Check building & door integrity for damage or leakage; doors closed (if required)		Closed doors ASAP	Daily	X	X	X
Check damper positions on ductwork are in the correct positions		Correct positioning	Daily	X	X	X
Check irrigation and humidification systems are functioning		Turn on systems or investigate malfunction.	Daily	X	-	-
Check for free discharge of effluent from drain		Investigate blockage	Daily	X	-	-

Check irrigation water supply is working at required rate	Visual check on flow gauge, investigate if required.	Monthly[1]	X	-	-
Check condensate removal points for free flow of liquid	Visual check	Daily/Monthly[1]	X	X	X
Check OCU condition for signs of damage or leaks	Call specialist contractor if identified	Daily / Monthly[1]	X	X	X
Check general ductwork for signs of damage or leaks	Condition of ductwork would be 'RAG' banded in the OCU contractor inspection reports. If broken, then odours not being conveyed to OCU and can be indicated by low inlet load. Worst case the ductwork is disconnected ('sucking air') such that odour removal is not taking place.	Daily / Monthly[1]	X	X	X
Check spray pattern from irrigation nozzles and clean nozzles as required	Adjust spray pattern, clean the strainer and unblock nozzles or replace as deemed necessary. Timescale durations of c. 2 weeks where just irrigation required.	Daily / Monthly[1]	X	-	X
Check flexi joints between fans and ductwork for leaks	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	X	X
Check fans for excessive vibration or noise, belt tension and bearing temperature	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	X	X
Check irrigation water pH	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	-	-
Check irrigation pumps condition and operation	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	-	
Check chemical reagent levels and supply	Order when required. Ensure no low-level alarms.	Weekly	-	-	X

Check chemical dosing and blow down pump condition and operation	If outside pH levels, investigate. Initiates blow down to correct level.	Daily/Monthly	-	-	X
Check blow down rate is within correct range	If outside pH levels, investigate. Initiates blow down to correct level.	Monthly	-	-	X
Check ph and Redox probes are working and in calibration	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	-	-	X
Check recirculating liquor strainer and replace if necessary	Flows recorded on SCADA	Monthly	-	-	X
Check water softener is working correctly (if installed)	Water hardener test papers used to check water quality.	Monthly	-	-	X
Check dampers are operational and in good condition	Swap over duty fan to stand by fan and record flow volumes to identify issue.	Monthly	X	X	X
Inspect electrical control panel and check for faults and alarms	Visual inspection by monhtly contractor and investigation any alarm conditions.	Monthly	X	X	X
Simulate duty / standby fan and pump changeover	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	X	X
Check H_2S meter is functioning and calibrated (if installed)	Check calibration is still in date during monthly contractor inspection.	Monthly	X	X	X

Monthly, quarterly and six monthly activities carried out by specialist contractors
Daily and weekly activities carried out by site operations

Condition of the media in the OCU is monitored by performance checks and by additional testing as required. LavaRok media is guaranteed for 25 years.

All two OCUs at Banbury are covered by a service and maintenance contract. They are inspected monthly and reports are sent to the performance manager. Figure 5.1 below highlights the scope of work required from our OCU Maintenance Contractors through their monthly visits. Monitoring during the visits is as follows:

- Monthly – flow (m^3/h), differential pressure(kPa) and hydrogen sulphide(ppm) at both the inlet and outlet. Where applicable, monitoring may also include fan hours run and removal efficiency of hydrogen sulphide.
- Quarterly – VOC(ppm) and mercaptans(ppm) at the inlet and outlet.

>50ppb hydrogen sulphide will be used as a threshold value for media change out. More detailed maintenance procedures are located in the SOM.

The OCU biofilters are specifically designed to minimise the release of odour, bioaerosols and microorganisms.

Optimum flow rates; trigger levels; odorous components/concentrations in the gas stream and associated physical properties are all important to OCU function and are described below:

(i)Optimum flow rate through the system to allow for effective treatment.

A '**Maximum velocity in duct work'**; rather than volume; is the key design aspect informing effective treatment for new/existing OCUs. Not exceeding 10m/second in a piece of ductwork will avoid noise break out; the industry benchmark for new plant being 8m/second. Given velocity is directly related to the volume; the specification is +/- 20% to reflect instrumentation variation; and therefore all 1 x 2 OCUs are checked to see ***if they can meet 6m/second*** with escalation in monthly contractor inspection reports where this value is not reached. This is a good indicator of functionality, appropriate sizing, and system health.

ii) The trigger levels/ranges for action if processes monitoring parameters are breached/ outside optimal parameters.

All OCUs, irrespective of media type, *will stipulate a minimum of 30 seconds* ***retention time***, for a biofilter to achieve a minimum of 95% removal efficiency. **Surface area** is the other part of the specification ***where the requirement is to achieve a maximum of 300m^3/hr/per m^2*** (for design purposes). It is surface area, and the ductwork values identified within question (i) above, that are the key informants to an evaluation of OCU performance. If this description of efficiency (across the bed) slips this would be raised for attention in the contractor monthly inspection reports. These values are better described as recognised industry standards rather than trigger points.

H2S readings are reported in the monthly service reports which inform odour equivalents (OEs). The accepted OEs for H2S at 1 part per million is equivalent to 2,000 odour units. A "red action" would be raised for any value 1 parts per million on the discharge from a biofilter, regardless of it's removal efficiency being met.

Trigger levels are more difficult to identify for other parameters, such as mercaptans and ammonia since the design assumptions for OCUs are informed by H2S removal. Removal for these parameters is therefore limited. For Total VOCs, *in respect to methane rather than small chain VOCs*, there is no removal.

From a qualitative value, from visual inspections, 'red flags;' would include if irrigation pipework to the biofilter is broken (no water entry to media); neither extraction fan running; broken ductwork leading to the OCU sucking in atmospheric air.

On identification of such red flags, such that the effective function of the OCU is at risk of being compromised, the following actions would be taken:

(i) For significant issues relating to any aspect of 'condition monitoring' - including effective function of the biofilters - impacting upon parameter reductions at the inlet/out; differential pressures or irrigation volumes – the Performance Manager would urgently contact Head of Maintenance at ERG to book in reactive maintenance attention. Timescales would be of highest priority but response times/duration dependent on the issue identified

(ii) For issues relating to housekeeping (leaks) or issues relating to OCU power supply (electrics) – for example, impacting either fan operation - these would be referred to a TWUL Electrician for assessment and either rectified by the area operational team or escalated to an external contractor where repairs are more complex. Timescale for expectation of resolution would typically be within 24 hours.

For either (i) and (ii) if any significant pollution risk (odour) was identified the Performance Manager would contact TWUL's incident help desk. A supporting risk would be recorded in APS (risk assessment software) to support funding where a need for remedial works was identified.

iii) Odorous components in the gas stream and concentrations of emissions

For ease of interpretation in the monthly inspection reports, H2S odour units at the Biofilter (& stack) outlet are linked to a design value of 250ouE/m3 and where typical values for Banbury are <200 (which links to the response to (i) above).

The monthly contractor inspections of each OCU provide data for H2S; VOC; Mercaptans (RsH). The sampling methodology being Drager (gas analysis) tube for c. 30 seconds to 2 minutes duration.

To achieve an appropriate level of surveillance on OCU performance, outside of the contractor monthly inspections, there is additional oversight from the Operations Management Team through:

- Daily site rounds by Thames Water technicians. These are Psion based checks using SAP Plus for escalations including, for example, internal MANDAT tickets or identifying a need for contractor support. The tasks in the daily checks mirror the numbered tasks in the contractor 'Monthly Health Checks'. See Figure 5.1 and section 9 in Appendix 5 in the OMP. There is connectivity between the site rounds and monthly contractor inspection reports.

iv) Physical properties of the air stream at point of control i.e., humidity, optimum temp, pH for effective odour control

For **humidity**, *the gas is humidified before being received by a biofilter,* so this parameter has less relevance. Biofilters post humidification standard being > 90%.

For **temperature**, this is fairly constant throughout the year as this is informed by the need to achieve fairly constant temperatures in the digestion process. A range of 20 to 40^{o}C being standard.

pH will be slightly variable depending on the H2S that is there from the condensing air stream contributing to SO2 formation. This tends not to be an issue at the biofilter itself since the active component of the biofilter will in itself produce SO2 as a waste product from converting the H2S.

pH off a bio-scrubber is checked on the quarterly inspections since it might suggest an issue with the active component of the biofilter being impacted by the accumulation of its waste product thereby making the lower part of the bed inactive. A pH of 2 to 3 would be expected as a theoretical upper limit to liquor discharged from the biofilter but recorded values are significantly less; pH 4 to 5 being typical (reflecting the logarithmic scale). Note if efficiency of the process is being impacted; pH would also be part of the investigative checks (i.e., more than quarterly).

5.1 Monthly OCU Health Check

Monthly Health Checks

Biofilter
Please enter any comments you may have in the yellow comments boxes

Number	Task	Comments
1	Examine ductwork for any signs of damage or leaks and check condensate drains are free flowing	
2	Visually inspect the Odour control system will be made and any defects or deterioration of the housings will be reported.	
3	Check the airflow through the system and any anomalies investigated.	
4	Measure the pressure drop across the system by measuring the inlet and outlet pressure. Record any abnormalities	
5	Measure the contaminate levels (primarily H2S) at the inlet and at the stack	
6	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
7	Examine the irrigation system to ensure correct operation including spray pattern, clean the strainer and unblock nozzles or replace as deemed necessary	
8	Take a sample of the drainage water and measure the pH value and compare to target pH value (this is not pH 7 for modern biotech)	
9	Check all hatches and doors for integrity and ensure they are closed	

Chemical Scrubber
Please enter any comments you may have in the yellow comments boxes

Number	Task	Comments
1	Examine ductwork for any signs of damage or leaks and check condensate drains are free flowing	
2	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
3	Visually inspect the Odour control system will be made and any defects or deterioration of the housings will be reported.	
4	Check the airflow through the system and any anomalies investigated.	
5	Measure the pressure drop across the system by measuring the inlet and outlet pressure. Record any abnormalities	
6	Measure the contaminate levels (primarily H2S) at the inlet and at the stack	
7	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
8	Examine the recirculation pumps and distribution pipework to ensure correct operation, clean the strainer and check trough / distributor.	
9	Carry out a functional check of the dosing system ensuring target pH and Redox are achieved, and validate the probe calibration using a handheld unit	
10	Calibrate if necessary	
11	Visually check the seals of all hatches note any leaks.	
12	Visually check the wet scrubber housing, note any significant deterioration	
13	Scrubber dosing cabinet - Check chemical dosing pumps for leaks	
14	Scrubber dosing cabinet - Check that dosing rates are correct	
15	Scrubber dosing cabinet - Check all valves, instruments and pipe-work for leaks	
16	Scrubber dosing cabinet - Check inside of cabinet for chemical residue and dirt and wash if necessary	
17	Scrubber dosing cabinet - After wash down check catch-pot high level alarm is working before draining	

Carbon Adsorber
Please enter any comments you may have in the yellow comments boxes

Number	Task	Comments
1	Examine ductwork for any signs of damage or leaks and check trapped condensate drains are free flowing. If a manual drain valve is provided, operate the valve until the flow of condensate ceases and leave valve in closed position.	
2	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
3	Visually inspect the Odour control system will be made and any defects or deterioration of the housings will be reported.	
4	Check the airflow through the system and any anomalies investigated.	
5	Measure the pressure drop across the system by measuring the inlet and outlet pressure. Record any abnormalities. Read off Delta-P gauge if fitted or using a portable manometer.	
6	Measure the contaminate levels (primarily H2S) at the inlet and at the stack	
7	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	

5.1.4 Maintenance Records

Maintenance history records are kept in the company's asset register.

5.2 Fault Reporting

Faults identified during routine inspections are reported to the Performance Manager or Process Controller (where applicable) who assesses criticality before entering the task into the job scheduling system for allocation to an appropriate person and to a timescale appropriate to the criticality.

5.3 Emergency Repairs

24-hour maintenance cover is available at the discretion of the Process Controller, Performance Manager or Duty Manager, with planned follow up. Less urgent repairs are assessed for criticality and dealt with during normal working hours.

6 Customer Communications

6.1 Customer Odour Complaints Process

Customer contacts regarding Banbury STW will be made via the Customer Centre, logged, and passed (directly, or via the OMC) to local Operations (Performance Manager and Customer and Stakeholder Manager) via e-mail. Operations will investigate and take appropriate action.

Customers / residents are encouraged to communicate with local Thames Water Operations via the Customer Centre to report if they are noticing odour from Banbury STW, to ensure that all contacts are recorded and actioned.

Thames Water Website – www.thameswater.co.uk. The form is called “Report A Problem”.

customer.feedback@thameswater.co.uk with the subject ‘Banbury Sewage Treatment Works’

Thames Water Customer Services
Telephone: 0800 316 9800

If the customer / resident would prefer to contact either Cherwell District Council or the Environment Agency instead, their contact details are as follows:

Cherwell District Council – Environmental Services
Telephone: (01295) 227001

Environment Agency
Incident hotline: 0800 80 70 60
Email: incident_communications_service@environment-agency.gov.uk

Complaints received on site at Banbury STW

Customer contacts regarding Banbury STW that are received directly on site are responded to by the local Operations team. The Performance Manager, at the earliest opportunity, will inform the Customer and Stakeholder Manager of the contact details in order that they can ensure the complaint is captured and recorded at the customer centre.

Complaints received via Customer Centre:

- Complaints are sent to Banbury STW Performance Manager and Customer & Stakeholder Manager from the Customer Centre via the Wastewater Control Centre.
- Operations will go out on site to physically check the operation of plant and will also go off site to check for odour in the vicinity of the complainant.
- Any problems will be noted and remedial work actioned.
- Contacts are checked by Banbury STW site management. The customer is contacted to discuss the outcome
- Actions are logged at Banbury STW and feedback is sent to the Wastewater Control Centre via the Customer and Stakeholder Manager; the customer contact is then closed.

Complaints received via Customer Centre out of normal working hours

- For a large number of calls, or serious concerns, the Out of Hours Coordinator will be contacted to respond.
- For all other calls Banbury STW site management will investigate and respond the next working day.

6.2 Customer Communication Plan

The Customer Communication Plan in Appendix 3 identifies how and when contact will be made with customers and stakeholders in relation to stable, abnormal and emergency site operation.

6.3 Investigating a Complaint

Upon receiving a complaint the Wastewater Control Centre have 24 working hours to respond to the customer with an update. Within these 24 hours, the Customer & Stakeholder Manager will contact to the performance manager who will carry out an investigation to determine whether the odour source is coming from the Thames Water site.

If the odour is decided to be from the Thames Water site, then the root cause is investigated.

The performance manager will review all activities currently taking place on site, including any maintenance, cleaning, and non-standard activities to identify to root cause, and ensure appropriate mitigation measures are in place. The root cause investigation may include site walkaround checks, which look for irregularities such as spillages / open doors and hatches, ensuring appropriate measures as detailed in table 4.3 and 4.4 are in place.

When the root cause of the odour is found, the customer will be updated with an explanation and provided with a timescale for its resolution. Furthermore, the situation is assessed for hazards to determine any possibility of health risk to the local community.

If the performance manager cannot identify the source of the odour, but complaints persist, the Customer & Stakeholder Manager will ensure the customer who made the complaint is contacted, and obtain further details. These details include their address in relation to the site location, the time of occurrence and for how long. If odour problems continue to persist, Thames Water may even ask the customer to keep a detailed odour diary to ensure their issue can be fully addressed.

To ensure any limitations regarding everyday staff becoming desensitised to the odour, if site odour complaints persist with no result in locating its source, personnel who do not spend prolonged time on a single site, such as the Area Operations Manager, will participate in the walkaround checks.

6.4 Notification of Operations with Potential to Cause an Odour Problem

Where operations may impact on local residents, notification will be made to the Customer Centre 24 hour room who will log the details on their Bulletin Board. This will be used to provide information directly to customers who call with queries. Emails and phone calls are used to inform external stakeholders of activities with potential to release odour Letter drops may also be used.

The Environmental Health Officer of Cherwell District Council will be contacted directly if there are risks of odour generation (e.g. digester cleaning, tank cleaning or process issues). NOTE: This will only take place on known sensitive sites where Local Authorities and the EHO are already involved.

If notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, Thames Water shall revise the OMP to identify and mitigate the risks of pollution from odour, and submit to the Environment Agency for approval within the period specified.

Appendices

Appendix 1. Odour Risk Assessment

Banbury STW SERV
Odour Risk Assessme

Summary of Critical odour issues

Site Name	Banbury STW		ODOUR RISK ASSESSMENT																
	17/02/20213																		
		Normal		Abnormal															
Process Stage	Process Unit	Odour Description	Constant/ Intermittent/ Occasional/ Rare	Event Description	Likelihood of Event Frequent/ Rare/ Planned	Length of Time of Release	Nearest Customer/ Receptor	Offensive-ness (0-5)	Likelihood of Impact (0-5)	Odour Risk (<5 Low, >15 High)	Odour Impact	Monitoring	Frequency	Recorded	Responsibility	Mitigation Measures	Residual Odour Impact (L/M/H)	Responsibility for Mitigation Measures	Customer Communication Needed?
Odour Control Packages	OUC1 Sludge holding tanks - Biofilter	Eggy	C	Failure of OCU	F	Months	Thorpe Ind. Estate. Chaulker Way	4	4	16	Odour complaints	Specialist contractor	Monthly	Yes	PM	Mit - Spray temp OCU as masking	L	PM	Y
Odour Control Packages	OUC2 Picket Fence Thickners - Carbon filter	Raw Sludge	C	Failure of OCU	F	Months	Thorpe Ind. Estate. Chaulker Way	4	4	16	Odour complaints	Specialist contractor	Monthly	Yes	PM	Mit - Spray temp OCU as masking	L	PM	Y

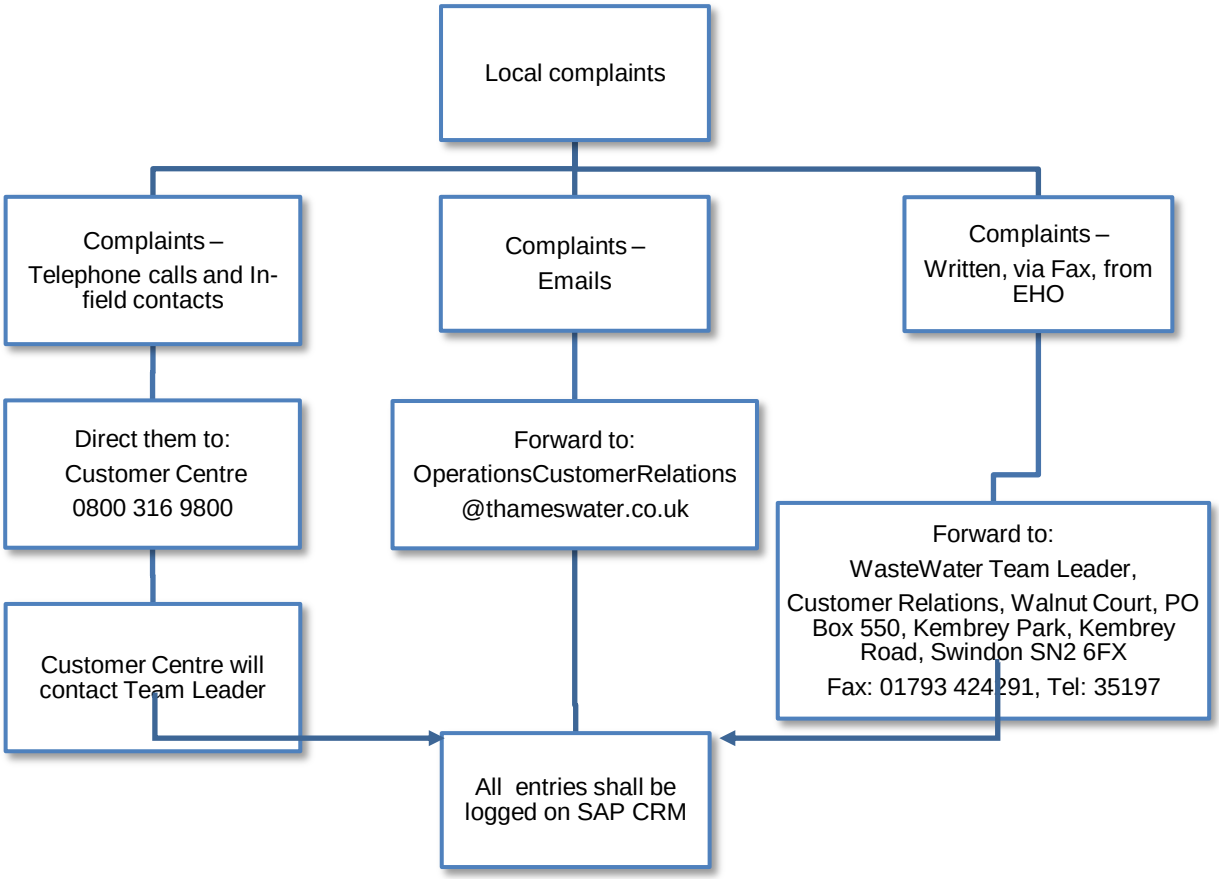
Appendix 2. Odour Improvement Plan

Odour Implementation Plan Banbury STW						
Date		May-23				
Process Stage	**Owner**	**Problem**	**Plan**	**Action**	**Expected difficulties**	**Measures to mitigate**	**Timeframe**
FtFT/P Project	Jon Gilliard	Additional PFT and sludge	Extension/replacement of existing OCUs planned as part of the FtFT / P project	1. Expanding the capacity of the existing OCU that connects into two existing PFTs adjacent to that OCU to allow for one additional PFT 2. Expanding the capacity of the existing OCU adjacent to the Sludge Reception Tanks to cater for an additional Sludge Blending Tank Not finalised yet whether these extensions will require replacement of the existing units or modification to cater for increased flows	Exsisting equipment not suitable for upgrade	N/A	Q2 2025
Sludge reception tanks and sludge transfer well	Diana Goodwin	hatches are not secure, but Should be closed. Issue is sometimes they are left open, which is monitored	Replace the roof on sludge reception tanks and sludge transfer well	Risk raised in APS for funding. 106699	Gaining funding	hatches are shut and or replaced after carrying out work in this location to prolong the life of the roof.	AMP8

Appendix 3. Customer Communications Plan

Complaints Process

All locally received complaints are re-directed to the Customer Centre. Please refer to figure below for details.



IMPORTANT NOTE:

Any communications received from the local Member of Parliament or senior council officers need to be forwarded to the Local/Regional Government Liaison person:

Name:	Miles Evans	Huw Thomas
Telephone:	07747 647304	07747 640011

Communications

Level 1	Stable operations: Compliant with Operational Asset Standards.			
Communications Approach	Standard regular proactive contact with key stakeholders.			
Stakeholders External	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local council(s) Environmental Health Department	As required but at least quarterly	Telephone / email / meeting	Update on operational activity on site	Performance Manager/ Customer & Stakeholder Manager
Local residents associations *(if applicable)*	As required but at least annually	Telephone / email / meeting	Update on operational activity on site	Performance Manager/ Customer & Stakeholder Manager
Environment Agency	As required	Telephone / email / meeting	Update on operational activity on site	Performance Manager and Air and Waste Environmental Permitting Team
Stakeholders Internal	**Frequency of Contact**	**Method & Level of Contact**	**Aim of Contact**	**TW Contact/Level**
Press Office	As required	Report sent out by operations to the business	Update the business on operational activity on site	Duty Manager
Customer Centre (Swindon)	As required	Report sent out by operations to the business	Update the business on operational activity on site	Duty Manager

Level 2	Unstable operations: • Non-compliant with Operational Asset Standards on one or more sub-processes leading to increased odour risk.			
Communications Approach	As Level 1 plus: • Use of Contact Centre Bulletin Boards / Briefing Contact Centre agents / Briefing statement with Q&A prepared for the press office (to use reactively). • Monthly discussions with, and quarterly visits from, the EHO. • Commence proactive communications with other stakeholders.			
Stakeholders External	**Frequency of Contact**	**Method & Level of Contact**	**Aim of Contact**	**TW Contact/Level**
Local council(s) Environmental Health Department	Immediately then monthly	Telephone / email / meeting	Report unstable operation with action plan	Performance Manager/ Customer & Stakeholder Manager
Local residents associations *(if applicable)*	Immediately then monthly	Telephone / email / meeting	Report unstable operation with action plan	Performance Manager/ Customer & Stakeholder Manager
Environment Agency	Potential for notification procedure	As required as per notification procedure	As required as per notification procedure	Pollution desk
Stakeholders Internal	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Press Office	Immediately then weekly	Q&A prepared for press office by Operations	To enable the press office to deal with queries from the press (reactive only).	Duty Manager
Customer Centre (Swindon)	Immediately then weekly	Telephone / email	To enable the Customer Centre to deal with queries from the press (reactive only).	Duty Manager
Other areas/stakeholders outside Banbury STW potentially impacted				
Stakeholder	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local businesses	Immediately then monthly	Telephone / email / meeting	Report unstable operation with action plan	Performance Manager/ Customer & Stakeholder Manager

Level 3	Emergency • Temporary or transient activities not deemed to be compliant with Operational Asset Standards. High risk of odour emitting plant.			
Communications Approach	As level 2 plus: • Odour event set up internally (including OOH's cover from OMC (Kemble Court)). • Weekly discussions with EHO. • Monthly Stakeholder meetings, (internal and external – include MPs, Councillors, schools, businesses etc.). • Press release may be required.			
Stakeholder External	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local council(s) Environmental Health Department	Immediately then weekly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Level 5/4 Manager/ Customer & Stakeholder manager
Local residents associations (if applicable)	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Performance Manager/ Customer & Stakeholder Manager
Councillors / MPs for local areas	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Level 5/4 Manager / Liaison via Local Government team.
Environment Agency	As required as per notification procedure	As required as per notification procedure	As required as per notification procedure	Pollution desk
Stakeholders Internal	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Press Office	Immediately then daily	Q&A and press release prepared by press office	To enable the press office to deal with reactive queries from the press and prepare a media strategy if required.	Duty Manager
Customer Centre (Swindon)	Immediately then daily	Telephone / email	To enable the Customer Centre to deal with queries from customers (reactive only)	Duty Manager

Other areas/stakeholders outside Banbury STW potentially impacted				
Stakeholder	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local businesses	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Performance Manager/ Customer & Stakeholder Manager

Appendix 4. Site Drawings

Figure A - Site Location Maps with marked receptors from table 2.1

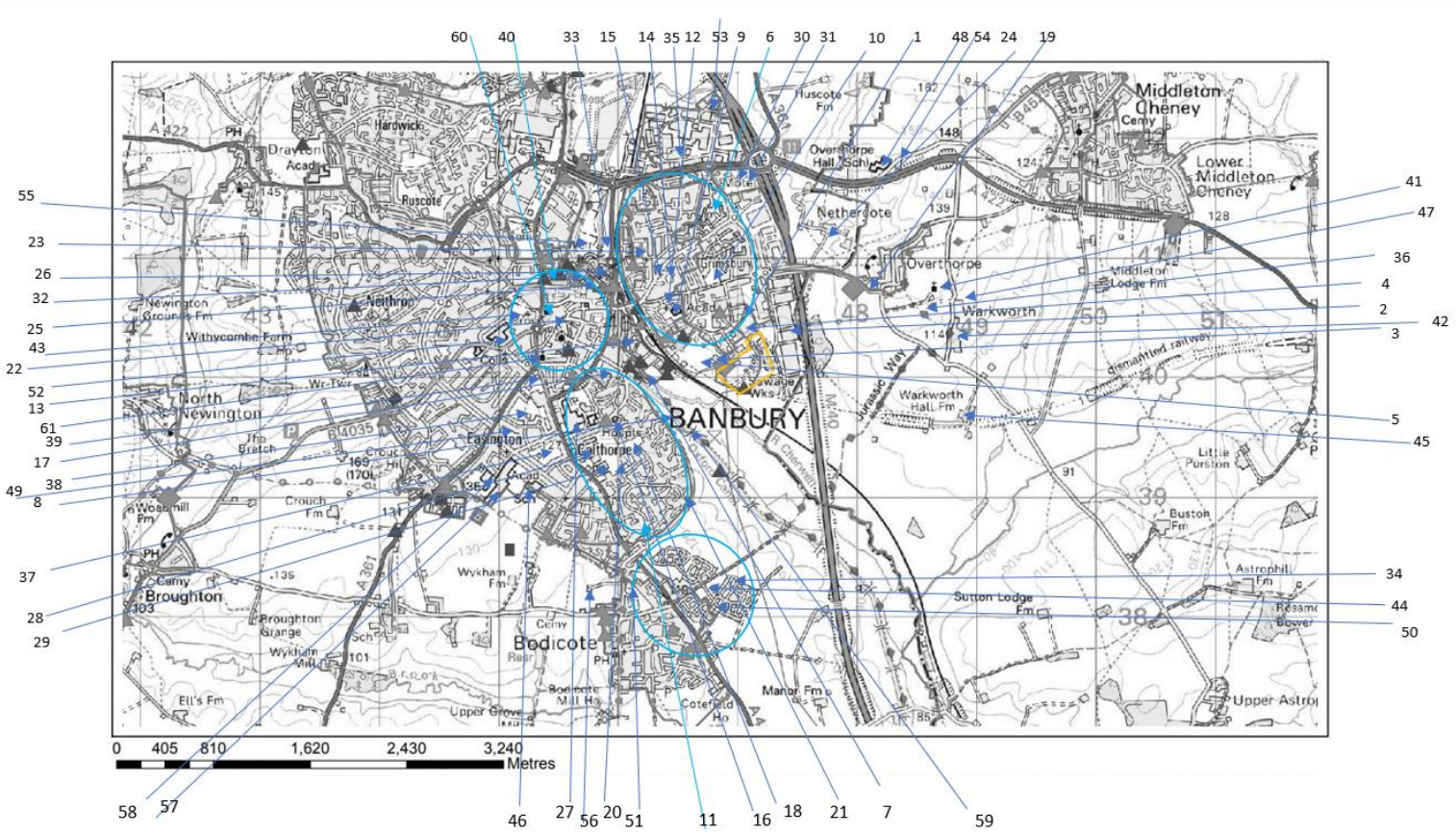


Figure B - Site Plan of Banbury STW

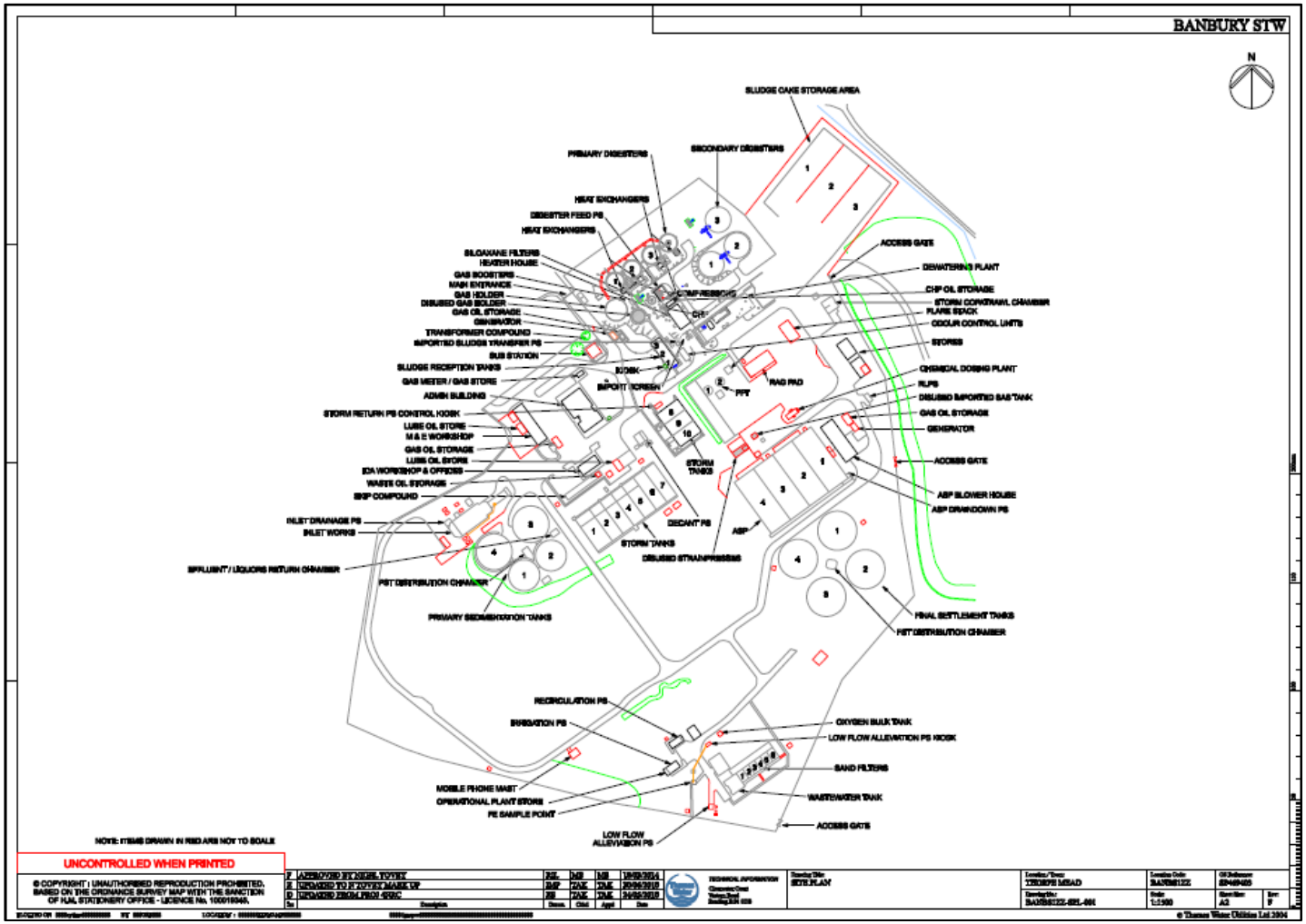


Figure C – Area permitted under EPR (reference number to be added with issued permit)

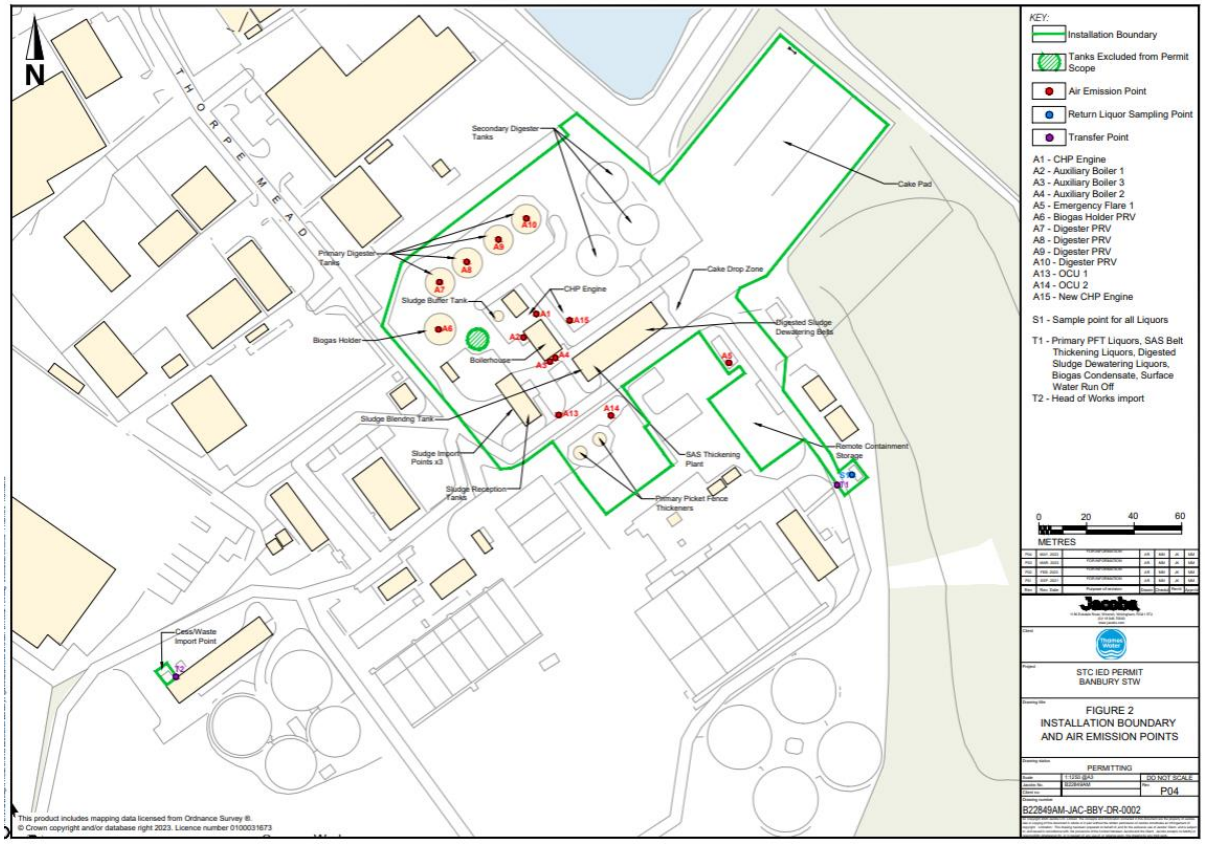


Figure D1 - Process Block Diagram for whole site

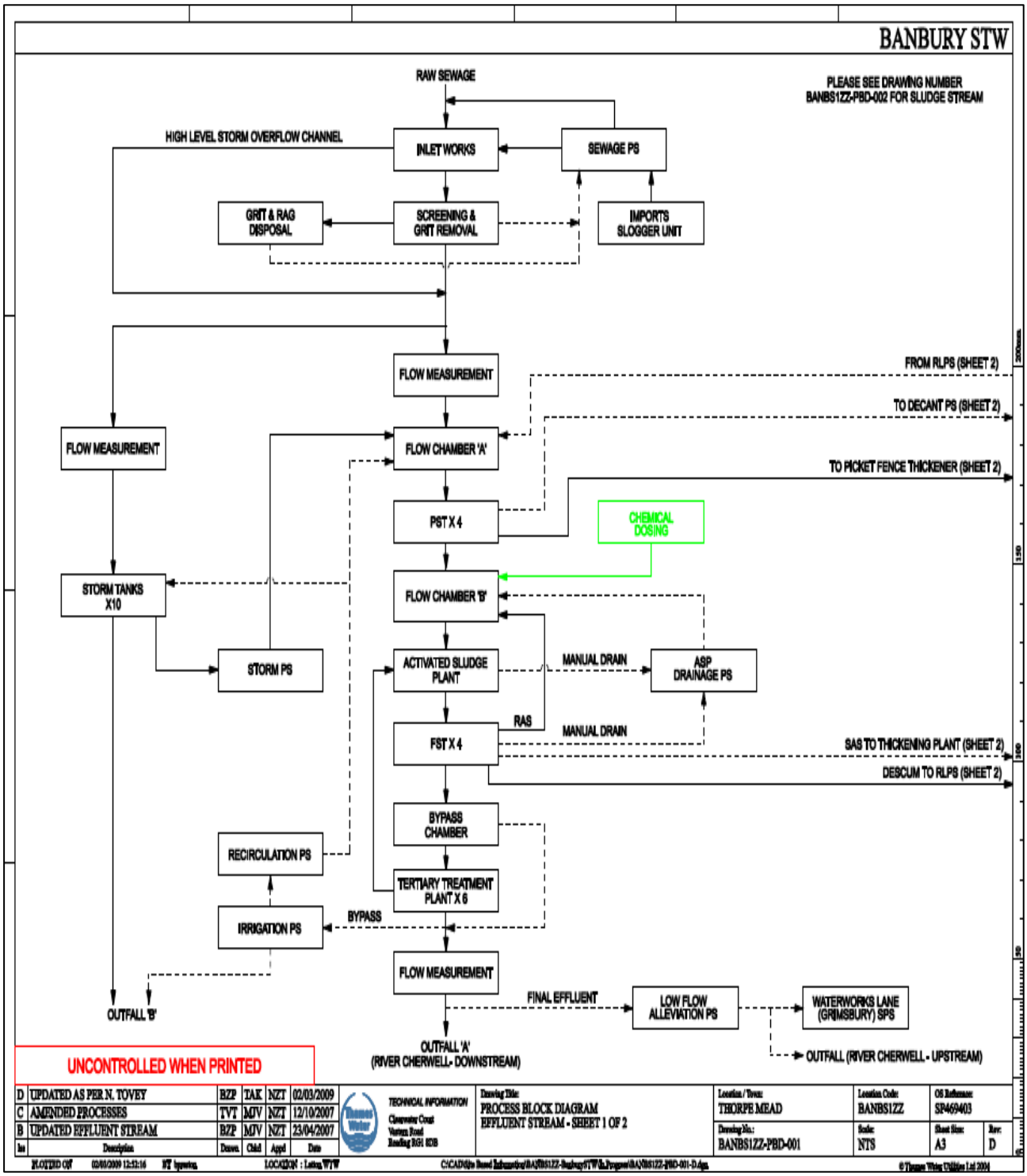
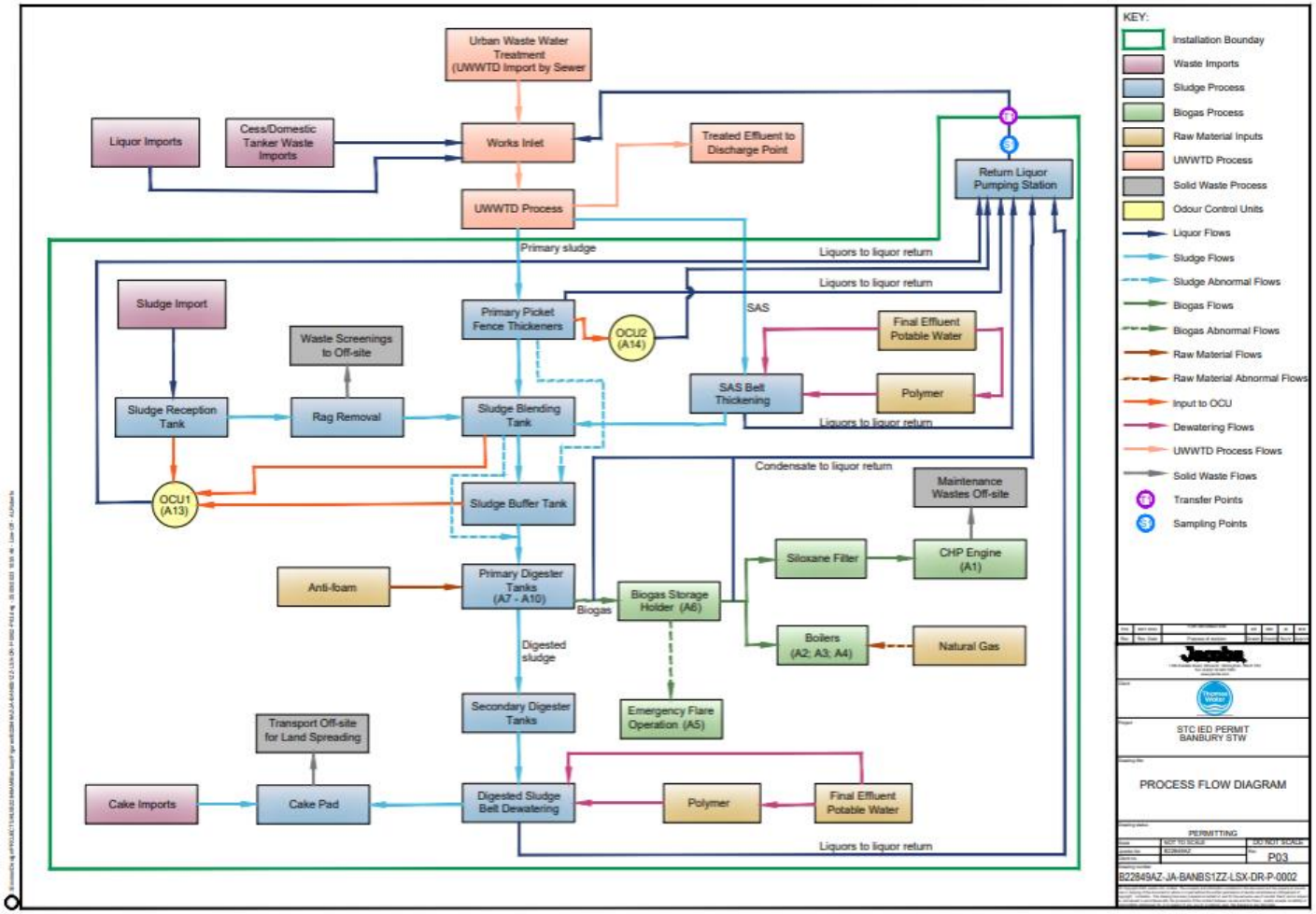


Figure D2 - Process Block Diagram for EPR assets



Appendix 5. Generic Site Round Checks

ID	Instruction	Daily	Weekly
1	**Final Effluent**		
a)	Check the effluent quality at the sample point. Sample (ammonia, phosphorus, temperature & turbidity) in accordance with SOM. Record in site log book & via Direct Text.	**X**	
b)	Check final effluent sampling point is accessible. Highlight to manager if need to clean inline monitor, channel/chamber.	**X**	
c)	Check storm sampling point is accessible. Highlight to manager if need to clean inline monitor, channel/chamber.	**X**	
d)	Visual check on point of discharge to the watercourse if accessible. Check operability of outfall flap valve if fitted.	**X**	
e)	Check storm discharge point, if shared & if accessible.	**X**	
f)	Compensation water pumps. Check and clear ultrasonic head of cobwebs etc.	**X**	
g)	Check data and operation of inline monitor. Check inline monitor installation for damage, take appropriate action where required.	**X**	
h)	Remove and clean inline monitor probe.		**X**
i)	Check flow meter & flume is clear of debris. Take appropriate action.	**X**	
2	**Preliminary Treatment**	Daily	Weekly
a)	Check Crude sewage appearance. Does it look normal for the site?	**X**	

ID	Instruction	Daily	Weekly
2.1	**Cess Waste Reception Point**		
a)	Note any suspicious activity or discharges as required	X	
b)	Check logger system is operating correctly	X	
c)	Check all pipework is in good condition	X	
d)	Where a macerator is fitted, check operation and oil reservoir	X	
e)	Where a manual stone trap is fitted, clear of accumulated material	X	
f)	Check grit bins are available and stocked with grit for winter	X	
g)	Carry out general housekeeping, remove litter, clear debris, washdown any spillages, empty bins	X	
h)	Ensure all signage is in good condition, clean and legible	X	
i)	Check washdown equipment is operating correctly	X	
2.2	**Inlet / storm pumping station**	Daily	Weekly
a)	Check Ammeter reading, Too high could indicate a blockage. Too low could indicate an air lock or impeller damage. Where reading is unusual ensure appropriate action is taken.	**X**	
b)	Check the well level is within the normal operating limits taking into account the flow conditions at the time (such as storm conditions & peak flow to site). If level is too low or high, this could indicate control issues or pumping issues.	**X**	
c)	Check condition of the wet well. Does it have more than the usual scum or debris floating on top that will indicate the need for a wet well clean?	**X**	
d)	Check fault light(s) are not on, take appropriate action as required.	**X**	

ID	Instruction	Daily	Weekly
e)	Check flow rate (where meter is fitted); is it within the normal operating range?	**X**	
f)	Inspect buildings, kiosks and control/switchgear panels for general condition, damage and that they are securely locked. Clean and tidy the interior of the buildings and/or Kiosks. Remove rubbish from site or if large volume arrange for collection.	x	
g)	Listen for undue pump noise and check for undue vibration by safely touching the lifting chain or guide rail.	**X**	
h)	Check non-return valve is operating correctly Non return valves prevent water from flowing back through the pump when it is not in operation. If a weighted arm is fitted is it at the usual angle? If it is low and chattering it could indicate the pump is blocked.	**X**	
i)	Check operation of the ultrasonic level control. Is it reading correctly? Compare the well level with the normal readout from the display. Check hard wired control floats, clean as required. Are floats weighed down with rag or debris preventing them from lifting if the water level rises?	**X**	
j)	Check pumps, pipelines and couplings for leaks where possible.		**X**
k)	Start the cleaning cycle manually where required.	**X**	
l)	Pumps - Log hours run		**X**
m)	Pumps - Log kWhrs		**X**
2.3	**Screen(s) / macerator(s)**	Daily	Weekly
a)	Check inlet channel level is normal taking into account the flow conditions at the time (such as storm conditions & peak flow to site).	**X**	
b)	Check screen operation and check for screenings carryover. Check for blockages and blinding (hairpinning) on screen panels and remove where necessary. Check for rag rolling or rag balls upstream of the screen and remove where necessary. Check for any grit build up in front of screen	**X**	

ID	Instruction	Daily	Weekly
c)	Inspect debris disposal mechanism for correct operation and verify screenings are being removed. Check & clean any obstructions impeding the operation of screen mechanisms.	**X**	
d)	Check screens bypass is available and clean	**X**	
e)	Clean area around screen. Check & clean screen panels of any obstructions.		**x**
f)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action to replace them if needed. Inspect grease pots and fill them when level is below the standard. Use grease nipples to lubricate required parts of screen.	**X**	
g)	Visually check unit and its associated equipment for the following: Safety & security with all panels locked & guards secure and in good condition. Excessive noise or vibration Overheating External damage, leaks, missing fixings Where applicable, ensure main and brush drives turn and that brushes are spinning	**X**	
h)	Check operation of wash water system for screens Ensure wash water pressure of spray bar is correct. Check the inline filter is present, clean and feeding the spray bars (where applicable). Check the spray bar pattern and clean the spray bar nozzles as required.	**X**	
i)	Check & clean accumulation of screenings and fat from debris disposal mechanism Check & clean launder chutes and channels for accumulation of grit, sand, rag, fat,	**X**	
j)	Check the lip, labyrinth or other seals between the screen and the channel wall are making an effective seal.	**X**	
k)	Visual check on the screenings removal brushes for blinding and wear.	**X**	

ID	Instruction	Daily	Weekly
	Clean the brushes as required. Ensure the brushes are in correct contact with the screen and that screenings are being removed.		
l)	Check and clean instrumentation probes, floats and ultrasonic heads (where applicable).	**X**	
2.4	**Screenings handling**	Daily	Weekly
a)	Check control system and amps on panel for normal levels / operation, take appropriate action as required. Jumping amps indicates a blockage.	**X**	
b)	Where installed, visual check for normal operation of macerator. Look for visible blockages/build up on unit, high flows in front of macerator. Listen for unusual noise. Take appropriate action as required.	**X**	
c)	Where installed, check and empty stone trap.	**X**	
d)	Clean area around screenings handling units and skips.		**X**
e)	Check operation of wash water system for screenings handling. Check the inline wash water filter is present, clean and feeding the spray bars (where applicable Ensure wash water pressure of spray bar is correct. Check the inline filter is present, clean and feeding the spray bars (where applicable). Check the spray bar pattern and clean the spray bar nozzles as required.	**X**	
f)	Check screenings product quality and quantity, Check level of screenings in skip and change skip when full.	**X**	
g)	Check operation of auto drain.		**x**
h)	Where installed check operation of the trough desludge system. Check for grit build-up in trough - hose out where required.		**x**
i)	Visual check on condition and operation of brushes (ensure trough is being cleaned). If blinding occurs regularly have wear on screw brushes checked.		**x**

ID	Instruction	Daily	Weekly
j)	Check screw conveyor and brushes for wear and central running.		**x**
k)	Clean and check mesh for blinding and hairpinning.		**x**
2.5	**Grit removal**	Daily	Weekly
a)	Check mechanical plant is operating correctly. Check equipment– Compressor, Rake, Detritor & Pista grit.	**X**	
b)	Check manually de-gritted constant velocity channels for build-up of grit, take appropriate action as required.	**X**	
c)	Check inflow and outflow for normal rate of flow and correct distribution.	**X**	
d)	Check volume, dryness and quality of grit produced.	**X**	
e)	Remove rag from the areas around baffles and mechanical equipment	**X**	
f)	Log manual de-gritting operations where required.	**X**	
g)	Log abnormal grit volumes.	**X**	
h)	Clean grit channel as required. Check grit build up in inlet channels and clean out if necessary.		**X**
i)	Check operation of wash water system and check the inline filter is present, clean and feeding the spray bars (where applicable)	**X**	
j)	Check aerated grit channels for air flow and bubble pattern (where applicable).	**X**	
2.5	Skips	Daily	Weekly
a)	Check skip capacity is adequate, and inform contractor when skip is full.	**X**	
b)	Rake skip where required.	**X**	
c)	Remove excess water if there is a facility to do so.	**X**	
d)	Ensure only prescribed material is in the skip. Remove any materials not prescribed.	**X**	
2.6	**Storm separation and treatment**	Daily	Weekly

ID	Instruction	Daily	Weekly
a)	Check Flow To Full Treatment penstock is set at correct level.	**X**	
b)	Check storm return system is operational, manually return storm contents where required.	**X**	
c)	Check storm tanks cleaning system, check level sensors, check tanks are clean and empty outside of storm conditions.	**X**	
d)	Check and clear storm screens where required. (automatic clearance and manual clearance linked to safe system of work)	**X**	
e)	Check screens bypass is available and clean	**X**	
f)	Check and clear/replace any outlet screening sacks		**X**
g)	Check separation weirs and clean where required.		**X**
h)	During storm check that the flow to treatment is normal. (Treating Flow To Full Treatment)		**X**
i)	Log abnormal flows. Log storm discharge flows. Log storm flows in dry weather conditions.		**X**
j)	Log storm events.		**X**
k)	Remove any debris in the system.		**X**
l)	Storm LTA – Visually check area is clean and operating within site parameters. Remove any debris.		**X**
m)	Storm LTA – Check for short circuiting during operation. Inspect banks for leakage		**X**
2.7	**Flow measurement**	Daily	Weekly
a)	Check site is within flow permit (treating Flow To Full Treatment before going to storm). Check that flow is going through site as expected.	**X**	
b)	Check flow meter and flume and clean where required	**X**	
c)	MCERTS – Log & record flow meter readings	**X**	
d)	Check EDM (Event Duration Monitor) sensor is clean and weir is free of debris	**X**	

ID	Instruction	Daily	Weekly
3	**Primary Treatment- Primary Settlement Tanks**	Daily	Weekly
a)	Check and log sludge level by dipping tanks (Mon/Wed/Fri)	**X**	
b)	Check bridge/scraper operation	**X**	
c)	Check de-sludge pump(s) and timer for normal operation	**X**	
d)	Check scum boards for breaks or carry under	**X**	
e)	Check scum trap for normal operation and clean/hose out	**X**	
f)	Check settled sewage quality (visual check only)	**X**	
g)	Check stilling chamber for rag, clear as necessary	**X**	
4	**Secondary Treatment**		
4.1	**Secondary Treatment – Activated Sludge**	Daily	Weekly
a)	Check air filters indicators for normal readings. Check blower control panel. Check the blowers for normal operation. Check there are no illuminated fault lights.	**X**	
b)	Check and record dissolved oxygen (D.O) readings, where probes are installed.	**X**	
c)	Sample, measure and record Mixed Liquor Suspended Solids (MLSS) /RASS concentration and sludge settleability (Stirred Specific Volume Index) (SSVI), (Monday/Wednesday/Friday)	**X**	
d)	Vent condensate from air lines		**X**
e)	Check SAS pump(s) are operating correctly	**X**	
f)	Check and record sludge return from the final settlement tanks (RAS rate)	**X**	
g)	Check D.O probe and / or timers are carrying out the correct control functions. Aeration control function.	**X**	
h)	Check flow distribution to aeration lanes if more than one lane present	**X**	

ID	Instruction	Daily	Weekly
i)	Log changes to RAS rate, Log flows (where meters are fitted), Log KWh, Log SAS Rate.	**X**	
j)	Check and record bubble pattern and size of the bubbles	**X**	
k)	Check mixers for rotation in anoxic (un-aerated) zones	**X**	
l)	Check recycle pumps are running, as required (Biological Nutrient Removal -BNR plants)		**X**
m)	Check redox monitor is operating correctly (BNR plants)		**X**
n)	Check VFA / liquor return (BNR plants)		**X**
o)	Check and record rate and frequency of SAS removal	**X**	
p)	Withdraw the D/O probe from the tank and remove clean		**X**
4.2	**Secondary Treatment – Biological Filters**	Daily	Weekly
a)	Visually check for correct flow distribution across the filter (radial distribution)	**X**	
b)	Keep filter surface clear of all debris and any significant moss or weed growth. Deal with ponding as appropriate.	**X**	
c)	Where recirculation is installed, check for normal operation at the correct flow rate	**X**	
d)	Check all air vents and under drains are clear and not flooded	**X**	
e)	Clear distribution arm orifices and or weir plates of debris	**X**	
f)	Remove end caps and rod/flush arms - clear debris from open channel arms	**X**	
g)	Check for appropriate flow distribution between filters to suit filter size	**X**	
h)	Check operation of distributor arms (uniform speed of rotation)	**X**	
i)	Check for leakage at the centre column seals and end caps. Short circuiting etc.	**X**	
j)	Check rotation timer. Check alignment of rotation alarm sensor and target plate	**X**	

ID	Instruction	Daily	Weekly
5	**Secondary Settlement – Humus Tanks / Final Settlement Tanks**	Daily	Weekly
a)	Check correct operation of desludging pump(s) or valve(s)	**X**	
b)	Check scraper/bridge operation where installed	**X**	
c)	Check and log blanket level with portable blanket meter where detectors not fitted. (Monday, Wednesday, Friday)	**X**	
d)	Check tank surface for buildup of floating debris. Visually check effluent quality over the weir for solids carry over	**X**	
e)	Check RAS pump(s) are operating correctly (FSTs only)	**X**	
f)	Check Bellmouth and de-rag where required	**X**	
g)	Check effectiveness of weir brushes, chains, “other systems” where fitted	**X**	
h)	Check scum boards for breaks or carry under	**X**	
i)	Check scum removal system for correct operation, clear any fouling where necessary	**X**	
j)	Check flow of recirculation bleed back/constant draw off where used	**X**	
k)	Check operation of fixed blanket detectors and alarms		**X**
l)	Check operation of Mallard pump by test running in hand, where installed		**X**
m)	Clear overflow weirs and launder channels of any build-up that will affect the tanks or effluent performance	**X**	
6	**Chemical Dosing**	Daily	Weekly
a)	Check that chemical is discharging, rather than dosing pump running dry (any nozzles blocked?)	**X**	
b)	Check chemical storage tank level - reorder as required. Log level in storage tank, Log discharge rate.		**2 days a week**
c)	Check for excessive vibration in the dosing pump		**2 days a week**
d)	Check the level in the internal bund and empty as required. Report any abnormalities.		**2 days a week**
e)	Visual check for leaks on tanks and visible chemical lines		**2 days a week**

ID	Instruction	Daily	Weekly
f)	Check the trace heating system		**2 days a week**
g)	Check external storage tank bund for rainwater and/or chemical. Empty as appropriate.		**X**
7	**Tertiary Treatment**		
7.1	**Low Head Sand Filter**	Daily	Weekly
a)	Check smooth movement of bridge, unusual sounds and vibrations, and abnormal flow patterns	**X**	
b)	Check water level in each filter, compare with other units and relate to flow rate, and last backwash	**X**	
c)	Check unit isn't in bypass	**X**	
d)	Check for evidence of chemical leaks	**X**	
e)	Check cleanliness of carriage & filter area	**X**	
f)	Check sodium hypochlorite level in the bridge tanks where fitted and fill from bulk tank	**X**	
g)	Check sodium hypochlorite bulk tank level	**X**	
h)	Check the amount of sand in the wash water	**X**	
i)	Check the colour of the backwash water	**X**	
j)	Check the correct amount of hypochlorite is being dosed	**X**	
k)	Check water level in each filter, compare with other units and relate to flow rate, and last backwash	**X**	
l)	Log backwash timer settings and head loss	**X**	
m)	Log flows and flow rate, where meters are fitted	**X**	
n)	Clean the level sensor head		**X**
o)	Log clarity of feed (compare with final effluent)	**X**	
7.2	**Disc Filter**	Daily	Weekly

ID	Instruction	Daily	Weekly
a)	Log backwash pressure	**X**	
b)	Check frequency of backwash is within correct range		**X**
c)	Check bypass is not working during normal operations	**X**	
d)	Check depth in and out of the drum for normal operation	**X**	
e)	Check drum is rotating in correct mode and sounds normal	**X**	
f)	Check all ancillaries are operating normally	**X**	
g)	Log flows and flow rate where meters are fitted	**X**	
h)	Sample and record turbidity on feed (compare with final effluent)	**X**	
i)	Inspect inside filter for large pieces of debris		**X**
j)	Check for accumulation of weed in backwash trough		**X**
k)	Check and clean backwash water strainer.		**X**
l)	Check for soundness of mesh panels by lifting inspection panels		**X**
m)	Check wash water pressure and nozzles for normal operation		**X**
8	**Raw Sludge Holding & Thickening**		
8.1	**Sludge Holding Tanks**	Daily	Weekly
a)	Check mixing regime is correct	**X**	
b)	Log levels in tank(s)	**X**	
c)	Decant liquors	**X**	
d)	Check tank(s) for ragging and blockages and clear or remove (where safe access is possible)	**X**	

ID	Instruction	Daily	Weekly
e)	Check that holes on sludge cage(s) are clear where fitted, Clean sludge cage(s) dewatering holes (where safe access is possible)	**X**	
f)	Log tanker movements and compare with schedule	**X**	
g)	Ensure any crust build up does not interfere with any control equipment/alarm floats	**X**	
8.2	**Picket Fence Thickener**	Daily	Weekly
a)	Check fence is rotating & “stop, look, listen,” for mechanical issues.	**X**	
b)	Check weir overflow quality and the surface of the unit. Clear any buildup of debris	**X**	
c)	Log blanket measurements / pump timers	**X**	
d)	Sample from discharge pump (run manually if necessary) and assess product quality. Sample, analyse and record % dry solids entering the PFT. Sample, analyse and record % dry solids out (Monday, Wednesday, Friday)	**X**	
e)	Check control system is operating normally	**X**	
f)	Log any changes to settings or duty	**X**	
g)	Log sludge flows in (where meters fitted) and out	**X**	
h)	Visually assess the dry solids & flow entering the PFT	**X**	
i)	Log hours run meters	**X**	
j)	Remove buildup of debris on the rake	**X**	
8.3	**Belt Thickeners**	Daily	Weekly
a)	Check for good floc formation. Check sludge on the top belt and assess the conditioning of the sludge. Check belt drainage and filtrate quality	**X**	
b)	Check product quality & quantity. Check condition of hopper	**X**	
c)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	**X**	

ID	Instruction	Daily	Weekly
d)	Sample, analyse & record % Dry Solids on feed and sludge/cake (Monday, Wednesday, Friday)	**X**	
e)	Check sludge feed rate and log	**X**	
f)	Check poly dosing system. Log polymer usage, note each bag change/delivery. Make adjustments to optimise	**X**	
g)	Ensure wash water pressure is available at a minimum of 6 bar	**X**	
h)	Clean belt steering paddles and check they are functioning correctly	**X**	
i)	Clean hopper level probes and check they are functioning correctly	**X**	
j)	Wash Station - Check formation of spraying fans, rotate internal brush to clean spray nozzles. (Minimum twice daily)	**X**	
k)	Visual Check - Hydraulic Power Pack - Check oil level and top up using clean equipment and fresh oil as required, maintain as close to full level as possible. Oil level must not be allowed to fall below 3/4 as this will cause serious damage	**X**	
l)	Jet wash clean the belt filter.	**X**	
m)	Use low pressure water hose to clean complete machine, frame, rollers and hoppers.	**X**	
n)	Check condition of Belt Filter for blinding / blockages / good filtration	**X**	
o)	High pressure steam clean the belt from underside.		**X**
p)	High pressure steam clean complete machine, frame rollers and hoppers avoiding all electrical and instrumentation equipment		**X**
q)	Check condition of Belt Filter for wear i.e. Creasing / condition of seam to avoid failure / breakage and damage to other components		**X**
8.4	**Drum Thickeners**	Daily	Weekly
a)	Check for good floc formation. Check sludge feed rate. Check product thickness (visually). Check filtrate quality	**X**	
b)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	**X**	

ID	Instruction	Daily	Weekly
c)	Sample for % dry solids analysis and record (Monday, Wednesday, Friday)	**X**	
d)	Check spray bar nozzles to ensure they are clear and spraying correctly. Check spray bar wash water pressure	**X**	
e)	Clean probes in discharge hopper, hose down and carry out cleaning duties	**X**	
f)	Log polyelectrolyte used – each drum/bag change	**X**	
g)	Log sludge inlet flow meter, monitor throughput	**X**	
h)	Check & clean flocculator tanks		**X**
i)	Check appearance of mesh, adjust cleaning and cleaning pause intervals if necessary.	**X**	
j)	Clean dry solids monitors sensors		**X**
k)	Clean foot valves on washwater suction lines		**X**
l)	Clean mechanical filter on washwater booster set		**X**
m)	Clean washwater booster secondary screen in channel		**X**
n)	Jet/remove fat deposits from thickened sludge discharge pipework		**X**
o)	Log hours run		**X**
9	**Odour Control**	**Daily**	**Weekly**
	Tasks for all Odour Control Units		
a)	Check covers, hatches and doors are closed	**X**	
b)	Confirm duty fan running and standby fan availability	**X**	
c)	Check damper position to ensure they have not been tampered with	**X**	
d)	Check ductwork for any signs of damage or leaks	**X**	

ID	Instruction	Daily	Weekly
	Specific tasks for Biofilter OCU		
e)	Check the spray pattern from the irrigation nozzles and clean nozzles where required. (If possible)	**X**	
f)	Check for free discharge of effluent water to drain	**X**	
g)	Check for free discharge on any condensate removal points	**X**	
	Specific tasks for Chemical Scrubber OCU		
h)	Check water softener availability, check salt reservoir level, and top up if required.	**X**	
i)	Check stocks in bulk chemical tanks and reorder if required – tanker delivery	**X**	
j)	Check that the Redox and pH are within the agreed range – on dosing skid	**X**	
k)	Check duty and standby dosing pumps are available for each bulk chemical	**X**	
l)	Check the duty scrubber liquor recirculation pump is running and the standby is available in auto	**X**	
m)	Check that there is free drainage of scrubber blow-down liquor to drain	**X**	
n)	Check differential pressure gauges are within design range (if fitted)	**X**	
o)	General check for leaks in the scrubber liquor recirculation and dosing system – raise follow on work if any defects are identified	**X**	
	Specific tasks for Carbon OCU		
p)	Examine ductwork for any signs of damage or leaks and check trapped condensate drains are free flowing. If a manual drain valve is provided, operate the valve until the flow of condensate ceases and leave valve in closed position.	**X**	
q)	Check differential pressure gauge for over-pressure (if provided) – indicates media fouling	**X**	
10	**On Site Pumping**	Daily	Weekly

ID	Instruction	Daily	Weekly
a)	Pumping System(s) (Drainage, Interstage, Washwater, Recirculation, Return Liquors etc.) operating correctly?	**X**	
b)	Check Ammeter reading - too high could indicate a blockage. Too low could indicate an air lock or impeller damage.	**X**	
c)	Check the well level is within the normal operating limits - taking into account the flow conditions at the time. If level is too low or high, this could indicate control issues or pumping issues.		
d)	Check condition of the wet well- does it have more than the usual scum or debris floating on top that will indicate the need for a wet well clean?		
e)	Check fault light(s) are not on	**X**	
f)	Check flow rate (where meter is fitted); is it within the normal operating range?	**X**	
g)	Check for undue pump noise and vibration by safely touching the lifting chain or guide rail.	**X**	
h)	Check non-return valve. Non return valves prevent water from flowing back through the pump when it is not in operation. If a weighted arm is fitted, is it at the usual angle? If it is low and chattering it could indicate the pump is blocked	**X**	
i)	Check operation of the ultrasonic level gauge. Is it reading correctly? Compare the well level with the normal readout from the display.	**X**	
j)	Check pumps, pipelines and couplings for leaks. Check for visible leaks.	**X**	
k)	Start the cleaning cycle manually where required	**X**	
l)	Pumps - Log hours run	**X**	
m)	Pumps - Log kWhrs	**X**	
n)	Check hard wired control floats - are floats weighed down with rag or debris preventing them from lifting if the water level rises.	**X**	

ID	Instruction	Daily	Weekly
o)	**Washwater Pumping** - Check the pipe line pressure from a gauge (where installed) on the pressure vessel or the pipe line manifold. Possible indication of strainer blockage	**X**	
p)	**Washwater Pumping** - Check operation of surge vessels (where installed).	**X**	
q)	**Washwater Pumping** - Check the strainers. If necessary, put automatic strainers in manual clean and inspect the manual strainers where local conditions allow.	**X**	
r)	**Washwater Pumping** - Check automatic filters are operating correctly	**X**	
11	**Distribution Chambers**	Daily	Weekly
a)	Inspect all weirs and brush clean. Remove any debris, scum, algal growth, blanket weed, grit, etc. from the chamber. Check flow split is correct.	**X**	
b)	Ensure any rag is removed, especially from around the penstocks, gate valves and their spindles. Ensure none of this passes over the weir.	**X**	
c)	Check that all valve, penstock and weir operating positions are correctly set.	**X**	
d)	Check chamber for any visible leaks	**X**	

Appendix 6. Generic Sludge Round Checks

	Instruction	Daily	Weekly
1	**Liquid Sludge Import Facilities**	Daily	Weekly
a)	Check sludge logger device is fully operational	**X**	
b)	Check that the pattern of imports is in line with site requirements/agreement with tanker operators.	**X**	
c)	Check general area is clean and tidy	**X**	
d)	Check reception tank for rag/grit build up		**X**
2	**Sludge Screen**	Daily	Weekly
a)	Check sludge screen operation	**X**	
b)	Check screened sludge quality	**X**	
c)	Check / clean moisture sensor	**X**	
d)	Visually check unit and its associated equipment for the following: Safety & security with all panels locked & guards secure and in good condition. Excessive noise or vibration Overheating External damage, leaks, missing fixings	**X**	
e)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action to replace them if needed. Inspect grease pots and fill them when level is below the standard. Use grease nipples to lubricate required parts of screen.	**X**	
f)	Carry out checks on cold weather operation systems before frost sets in	**X**	
g)	Check screenings quality & quantity		**X**
h)	Check general area is clean and tidy		**X**
i)	Check washwater is operating correctly during period of sludge discharge Ensure wash water pressure of spray bar is correct. Check the inline filter is present, clean and feeding the spray bars (where applicable). Check the spray bar pattern and clean the spray bar nozzles as required.		**X**
j)	Clean steel probes on rotamat screen		**X**

	Instruction	Daily	Weekly
3	**Sludge Buffer & Blending Tanks** "Sludge Blending Tank" refers to a tank, into which more than one type of sludge is fed, requiring mixing: normally immediately prior to sludge digestion or dewatering. It may on some sites be referred to as a sludge holding tank or digester feed tank.	Daily	Weekly
a)	Check that mixer is operating correctly. Mixers are normally inhibited if the sludge level falls below a set level to protect the impellor, pump or blower.	**X**	
b)	Check for signs of stratification or poor mixing and rectify where necessary	**X**	
c)	Check pH and if less than 5 attempt to reduce septicity and freshen sludge	**X**	
d)	Check for ragging and blockages and clear or remove (where safe access is possible)	**X**	
e)	Check amps on mixer motor		**X**
f)	Check tank control system		**X**
4	**Sludge Treatment Inter Process Pumping**	Daily	Weekly
a)	Check Ammeter reading, Too high could indicate a blockage. Too low could indicate an air lock or impeller damage. Where reading is unusual ensure appropriate action is taken.	**X**	
b)	Check flow rate (where meter is fitted); Is it within the normal operating range?	**X**	
c)	Check the well level is within the normal operating limits taking into account the flow conditions at the time. If level is too low or high, this could indicate control issues or pumping issues.	**X**	
d)	Check operation of the ultrasonic level gauge. Is it reading correctly? Compare the well level with the normal readout from the display.	**X**	
e)	Listen for undue pump noise and check for undue vibration by safely touching the lifting chain or guide rail.	**X**	
f)	Check pumps, pipelines and couplings for visible leaks	**X**	
g)	Check non-return valve is operating correctly Non return valves prevent water from flowing back through the pump when it is not in operation. If a weighted arm is fitted is it at the usual angle? If it is low and chattering it could indicate the pump is blocked.	**X**	
5	**Pasteurisation**	Daily	Weekly

	Instruction	Daily	Weekly
a)	Check batch rates according to sludge levels	X	
b)	Check digester temperatures in relation to pasteurisation plant	X	
c)	Check hmi panel	X	
d)	Check operation of biotherm reactor aeration blower package.	X	
e)	Check heat exchanger performance	X	
f)	Check digested sludge buffer tanks	X	
g)	Check blended sludge buffer tanks	X	
h)	Check operation of biotherm reactor mixer	X	
i)	Check operation of heat exchanger mixer	X	
j)	Check operation of scum cutter	X	
k)	Check pump and valve operation	X	
l)	Log and record flows, pressures and temperatures	X	
m)	Check % ds of feed sludge to pasteurisation plant (Monday, Wednesday, Friday)	X	
n)	Check, remove and clean temperature probe		X
6	**Primary Sludge Digestion**	Daily	Weekly
a)	Check sludge discharge to limpet chambers, where installed. Clear any blockages	X	
b)	Check digester feed system is working Clear any blockages	X	
c)	Check digester heating system is working & temperatures are within HACCP range.	X	
d)	Check digester mixing system is operating correctly	X	
e)	Log digester temperatures (HACCP) Log inlet and outlet temperatures of each boiler Log inlet and outlet temperatures of sludge and water in heat exchangers	X	
f)	Log sludge feed volumes into each digester and establish the retention time (HACCP)	X	
g)	Check operation of sludge and water recirculation pumps Check pumps, pipelines and couplings for leaks where possible.	X	
h)	Monitor water supply where glycol is not used to heat exchanges that are exposed to elements, Ensure water is drained when heat exchanges are not in use.	X	
i)	Log use of secondary fuel within boilers.	X	
j)	Sample sludge into and out of digester.	X	

	Instruction	Daily	Weekly
	Analyse and record % dry solids. (Monday, Wednesday, Friday.) Analyse and record % volatile matter. (3 times a week Monday – Thursday)		
k)	Check digesters for foaming on the top.		**X**
l)	Remove grit from base of digester if facility is provided. **Do not** leave grit removal operation unattended and ensure valve is fully closed before leaving task.		**X**
m)	Sample, measure and record pH of digested sludge		**X**
7	**Secondary Sludge Digestion**	Daily	Weekly
a)	Check mixing system, for short-circuiting or separation, Mix before transfer to the next process, where facilities exist	**X**	
b)	Decant supernatant liquor when required	**X**	
c)	Log status of each tank	**X**	
d)	Record number of day's storage	**X**	
8	**Biogas Handling, Storage, & Utilisation.**	Daily	Weekly
a)	Check all condensate traps manually and drain or top up if necessary. This check is required **twice daily** in prolonged periods of warm weather. Check automatic u-tubes visually, to ensure that there are no gas leaks or freezing Check automatic drain traps working correctly. Use manual drains if automatic drains not working, report defects	**X**	
b)	Check glycol pressure relief valve and ensure liquid level visible in sight glass	**X**	
c)	Check pressure/vacuum relief (whessoe) valves are not passing biogas. Listen for gas passing, note any unusual smell, visual check of valve.	**X**	
d)	Check for genuine operation of flare stack / waste gas burner, e.g. chp is at full power and there is excessive gas make	**X**	
e)	Check and record dehumidifier temperature	**X**	
f)	Log gas volumes: produced, flared, to chp, to boilers	**X**	
g)	Sample, monitor & record methane composition of biogas	**X**	
h)	Manually check gas isolation valve handle operation by closing & opening valve.		**X**
9	**CHP & Biogas Power Management**	Daily	Weekly
a)	Check automatic drain traps working correctly. Use manual drains if automatic drains not working, report defects	**X**	

	Instruction	Daily	Weekly
b)	Check for genuine operation of flare stack / waste gas burner, e.g. CHP is at full power and there is excessive gas make	X	
c)	Check glycol pressure relief valve and ensure liquid level visible in sight glass	X	
d)	Check & log hours run	X	
e)	Check & log kwh exported (where relevant)	X	
f)	Check & log kwh generated	X	
g)	Check & log kwh used on site	X	
h)	Check & log use of secondary fuel	X	
i)	Check & log gas used	X	
j)	Check & log heat liberated from engine, heat dumped, heat liberated from boilers	X	
k)	Check & log engine temperatures and pressures, by exception	X	
l)	Check & log gas stream for methane composition		X
m)	Check automatic u-tubes to ensure that there are no gas leaks or freezing		X
n)	Check pressure/vacuum relief (whessoe) valves are not passing biogas. Listen for gas passing, note any unusual smell, visual check of valve.	X	
10	**Liquor Treatment**	Daily	Weekly
a)	Check return liquors and return rate	X	
11	**Chemical Dosing**	Daily	Weekly
a)	Check that chemical is discharging, not just dosing pump running (any nozzles blocked?)	X	
b)	Check chemical storage tank level - reorder as required	X	
c)	Check for excessive vibration in the dosing pump	X	
d)	Check the level in the internal bund and empty as required	X	
e)	Check for leaks on visible chemical lines	X	
f)	Check the trace heating system	X	
g)	Check external storage tank bund for rainwater and/or chemical. Empty as appropriate.		X
h)	Check the correct amount of chemical is being delivered for the conditions		X
i)	Check storage tank can take delivery before delivering		X
12	**Sludge Dewatering – Belt Press**	Daily	Weekly

	Instruction	Daily	Weekly
a)	Check poly dosing system, Log polymer usage, note each bag change/delivery, Make adjustments to optimize	X	-
b)	Check sludge feed rate and log	X	
c)	Check sludge on the top belt and assess the conditioning of the sludge, Check belt drainage and filtrate quality	X	
d)	Check product quality & quantity, Check condition of stockpile	X	
e)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	X	
f)	Ensure wash water pressure is available at a minimum of 6 bar	X	
g)	Clean belt steering paddles and check they are functioning correctly	X	
h)	Clean hopper level probes and check they are functioning correctly	X	
i)	Wash station - check formation of spraying fans, rotate internal brush to clean spray nozzles. (minimum twice daily)	X	
j)	Visual Check - Hydraulic power pack - check oil level top up using clean equipment and fresh oil as required, maintain as close to full level as possible. Oil level must not be allowed to fall below 3/4 as this will cause serious damage	X	
k)	Jet wash clean the belt filter.	X	
l)	Use low pressure water hose to clean complete machine, frame, rollers and hoppers.	X	
m)	Check condition of belt filter for blinding / blockages / good filtration	X	
n)	Steering flaps - check condition and correct operation for activation of the hydraulic steering mechanism and check for wear and replace as required	X	
o)	Sample, analyse & record % dry solids on feed and cake, (Monday, Wednesday, Friday)	X	
p)	High pressure steam clean the belt from underside.		X
q)	High pressure steam clean complete machine, frame rollers and hoppers avoiding all electrical and instrumentation equipment		X
r)	Check condition of belt filter for wear i.e. Creasing / condition of seam to avoid failure / breakage and damage to other components		X
13	**Sludge Dewatering – Centrifuge**	Daily	Weekly
a)	Check condition of stockpile, Check quality of product	X	
b)	Check kwh, amps and hours run	X	
c)	Check poly dosing system	X	

	Instruction	Daily	Weekly
d)	Check quality of centrate	X	
e)	Check sludge feed rate, Check quality of product in feed	X	
f)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	X	
g)	Log hours run	X	
h)	Log kwh hours run	X	
i)	Log polymer usage, note each bag change/delivery	X	
j)	Log sludge flow rate	X	
k)	Log volume of cake produced	X	
l)	Make adjustments to get optimum throughput, product quality and poly dosing	X	
m)	Sample, analyse & record % dry solids on feed and cake (Monday, Wednesday, Friday)	X	
14	**Poly Make Up, Storage, & Dosing – Liquid**	Daily	Weekly
a)	Poly make up storage & dosing – liquid - check supply of polymer held in IBC; Top up, replace, order as appropriate	X	
b)	Liquid - check dosing pumps & settings	X	
c)	Liquid - check dilution water is available	X	
d)	Liquid - clean up any spillages of liquid	X	
e)	Liquid - log usage of polymer i.e. IBCs level	X	
f)	Liquid - log settings of dosing pumps	X	
g)	Liquid - log type of polymer	X	
h)	Liquid - check polymer flowmeter pressure – if above 3 bar clean filter and mixer		X
i)	Liquid - check made up solution appears ok	X	
j)	Liquid - check bunded area for spillages	X	
15	**Poly Make Up, Storage, & Dosing – Powder**	Daily	Weekly
a)	Dry powder - check dosing pumps & settings	X	
b)	Dry powder - check supply of polymer held in silo; Top up, replace, order as appropriate	X	
c)	Dry powder - check bunded area for spillages	X	
d)	Dry powder - check dilution water	X	
e)	Dry powder - check dry room / silo is heated, dry and doors are closed	X	

	Instruction	Daily	Weekly
f)	Dry powder - check made up solution appears ok	X	
g)	Dry powder - check polymer is dry and flowing, look at screw drive and discharge to wetted head – "JETWET"	X	
h)	Dry powder - clean up any spillages	X	
i)	Dry powder - log settings of dosing pumps	X	
j)	Dry powder - log type of polymer, check using correct polymer.	X	
k)	Dry powder - log usage of polymer i.e. bags used	X	
l)	Dry powder - check polymer flowmeter pressure – if above 3 bar clean filter and mixer		X
16	**Sludge Cake Transfer**	Daily	Weekly
a)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	X	
b)	Check conveyor rollers & keep clear	X	
c)	Check drive bearings for wear & operation	X	
d)	Check electric trip wire emergency stop wire	X	
e)	Keep general area clean. Clear up any spillages	X	
f)	Check belt condition	X	
17	**Sludge Cake Storage**	Daily	Weekly
a)	Ensure silo not filled above 70% capacity. Inform Bio-recycling of any changes to sludge production.	X	
b)	Keep general area clean to minimise odour	X	
c)	Log & record each storage pad bay activity and status if applicable	X	
d)	Check wheel wash is operational	X	

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