Asset Management
Asset Standard
Odour Management Plan

Beddington STW

BEDDS1ZZ

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0 Document Control & Procedures

0.1 Contents

Figures and Tables:

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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
0	Creation of Beddington OMP	[redacted]	-	Nov 06
1.0	Consideration of 2006 Odournet report		-	Jan 07
1.2	Review of document			Aug 09
1.3	OMP revision			Dec 11
1.4	Revised to include new dewatering equipment			Nov 12
1.5	Conversion and validation of OMP into new Standard format			February 2014
2.1	Update from GBM			Dec 2014

Revision No	Reason for Revision	Prepared by	Approved by	Date
3.0	Review and update of OMP	[redacted]		April 2017
4.0	Review and update of OMP			Feb 2019
5.0	New Sludge Treatment Centre Permit Application			April 2022
5.1	Sludge Treatment Centre Permit Resubmission			November 2023

0.4 Sign Off

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

0.5 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
EA	Environment Agency
EHO	Environmental Health Officer
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016
FFT	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	Process 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
SHT	Sludge holding tank
SOM	Site Operating Manual
STC	Sludge Treatment Centre
STW	Sewage Treatment Works
TM	Team Manager
TCM	Technically Competent Manager
UWWTD	Urban Waste Water Treatment Directive

1 Introduction

This Odour Management Plan (OMP) forms part of Beddington 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 Beddington 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 Beddington 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 changes.
- 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 2022 to incorporate appropriate odour control measures for activities that will be newly regulated under an Environmental Permit issued under the Environmental Permitting (England and Wales) Regulations 2016 (EPR), 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 (AD) 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, the anaerobic digestion (AD) 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 permitted 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.

1.1 Relevant Guidance

The following guidance has been used to inform the contents of the OMP where it relates to activities regulated under the 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)

Where this Odour Management Plan relates to STW activities regulated under the 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 these activities.

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

Copies of the Odour Risk Assessment, Odour Improvement Plan, Customer Communications Plan, Site drawings and Service delivery plan for removal of sludge cake from Beddington Sewage Treatment Works are included in Appendices 1-5.

2 Site Information

2.1 Location and Receptors

Site Address:

Beddington STW
Beddington Lane
Croydon
Surrey
CR0 4TH
Permit number: EPR/YP3430LL/V006
EPR permit number for STC to be included when issued
What 3 words: bolts.cute.slides

Beddington STW is a large wastewater treatment works situated in Croydon, Surrey. A sewage treatment works was initially constructed in 1902. After the Second World War, flows increased to such a level that in 1962, it was decided to construct an entirely new works. This was completed by 1974.

The site currently provides wastewater treatment for a population equivalent of approximately 405,000 from the London Borough of Croydon, parts of Sutton and the districts of Reigate, Banstead and Tandridge. The average daily flow into the works is 103,000 m^3, with a maximum flow capacity to full treatment of 234,000 m^3/day.

Receptors

The nearest receptors are given in Table 2.1 below and have been marked on the site location Map in Appendix 4, figure A.

Table 2.1 - Location of potentially sensitive odour receptors.

Receptor Number	Receptor Type	Receptor Name	Approximate distance to the nearest site boundary (km)	Direction from the site	Receptor sensitivity
1	School	Hackbridge Primary School - London Road Campus	1.24	North-West	High
2	School	Humpty Dumpty Pre-School	1.3	North-West	High
3	School	Culvers House Primary School	1.38	North-West	High
4	School	Mill House Day Nursery	1.67	North-West	High
5	School	Spencer Nursery School	1.58	North-West	High
6	School	Hackbridge Primary School - Hackbridge Corner Site	1.19	West	High
7	School	Greenholm School Strawberry Lodge Campus	1.63	South-West	High
8	School	Busy Bees Pre-school	1.7	South-West	High
9	School	Wallington County Grammar School	1.24	South-West	High
10	School	Collingwood School	2	South-West	High
11	School	Holy Trinity C of E Junior School	1.31	South-West	High
12	School	Beddington Infants' School	1.12	South-West	High
13	School	Carew Academy	0.69	South	High
14	School	ABC Pre-School	0.77	South	High
15	School	Sherwood Park School	0.93	South	High

16	School	Beddington Park Primary School	0.65	South	High
17	School	The Link Primary School	1.33	South	High
18	School	The Link Secondary School	1.46	South-East	High
19	School	Childcare Happy Days	1.34	South-East	High
20	School	Harris Primary Academy Croydon	1.24	South-East	High
21	School	Al-Khair Primary School	1.96	South-East	High
22	School	West Thornton Primary School	1.18	North-East	High
23	School	The Archbishop Lanfranc Academy	1.1	East	High
24	School	Gonville Academy	1.78	North-East	High
25	School	London School of Law and Management	1.84	North-East	High
26	Commercial	Lidl	1.15	West	Medium
27	Commercial	Sainsbury's Local	1.11	West	Medium
28	Commercial	IKEA	0.62	East	Medium
29	Commercial	JD Sports	0.57	East	Medium
30	Commercial	Croydon Valley Leisure Retail (Nike Unite Croydon, Dunelm Croydon, Fabb Furniture Croydon)	0.41	East	Medium
31	Commercial	TradePoint Croydon	0.37	East	Medium
32	Commercial	Adidas Outlet Store	0.97	South-East	Medium

33	Commercial	Sainsbury's Local	1.05	South-East	Medium
34	Industrial	DHL Express Croydon	0.35	North	Low
35	Commercial	Croydon Valley Trade Park/Therapia Trading Estate	0.2	North-East	Medium
36	Commercial	Asda Wallington Superstore	0.26	South-East	Medium
37	Commercial	Croydon Rifle & Pistol Club	0.75	North	Medium
38	Industrial	FedEx Station	0.85	North	Low
39	Recreational	Beddington Cricket Club	0.41	South-West	Low
40	Recreational	Beddington Park & Football Club	0.42	South-West	Low
41	Recreational	Watercress Park	1.6	West	Low
42	Recreational	Wandle Park	1.4	South-East	Low
43	Recreational	The Grange Garden	0.95	South-West	Low
44	Transport	Hackbridge Train Station	1.03	West	Medium
45	Industrial	Russell Richard (Panels)	0.16	West	Low
46	Commercial	Mercedes-Benz of Croydon	0.94	East	Medium
47	Hospital	Croydon University Hospital	2	North-East	High
48	Open area	Beddington Farmlanads	0.3	West	Low
49	Residential area	Board Green Residential Area	0.89	East	High
50	Residential area	Residential Areas south from Crispin Crescent	0.31	South	High
51	Residential area	Hackbridge Residential Area	1.02	West	High

52	Residential area	Residential Areas at Elberon Avenue and further North	0.75	North	High
53	Residential area	Residential Areas at Rochford Way	0.9	North-East	High
54	Residential area	Residential Areas at Kelvin Gardens and Franklin Way	0.66	North-East	High
55	Residential area	Residential Areas along Canterbury Road	1.16	North-East	High
56	Residential area	Residential Areas between east of Purley Way and west of Mitcham Road	1.1	East	High
57	Open area	Croydon Cemetery	0.95	North-East	Low

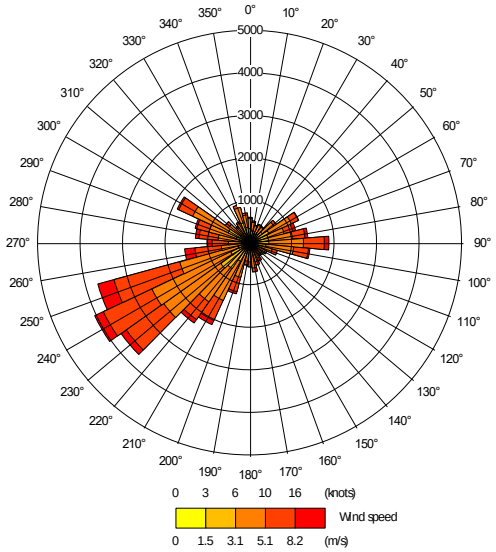
2.2 Off-site sources of odour

Other sources of odours beyond the STW boundary are due to the extensive landfill area and composting facility operated by Viridor plus a large industrial area to the east which includes a number of waste facilities.

2.3 Wind Rose and Weather Monitoring

London/City Airport meteorological station (approximate location NGR E 543189 N 180444) is located approximately 19.3 km northeast 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 London/City Airport meteorological station Wind Rose 2016-2020



There is no on-site weather station at Beddington. 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

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.

The following sections describe the processes of wastewater and sludge treatment and should be read in conjunction with the site plan and process flow diagram given in Figures B and D in Appendix 4.

2.5 Process Description

2.5.1 UWWTD activities

The incoming wastewater is first screened, removing anything larger than 6mm. Any grit within the sewage is then allowed to settle out before the effluent is passed through primary settlement and aeration lanes. Surplus activated sludge is returned to the inlet for co-settlement in the primary tanks. The sludge that settles out during these processes is sent first to a thickening plant, then on to primary

digestion and finally dewatered on belt presses, before being transported from site for further treatment as required for agricultural use, or other means of disposal. The old sludge lagoons, have been made redundant by the new dewatering plant. ,

The treated final effluent is discharged to the River Wandle at Mill Green, Hackbridge.

2.5.2 Sludge Treatment Centre Permit Activities

The biological treatment of sludge includes treatment of the indigenous sewage sludge and Surplus Activated Sludge (SAS) from the onsite aerobic treatment process and treatment of imported sewage sludges from other sites, arriving by road to a dedicated sludge import point. The indigenous sewage sludges are generated from the aerobic treatment of both waste waters from the sewer network arriving into the site at the works inlet, and, from imported waste materials, arriving by road transport into a dedicated waste import point near to the works inlet.

The operation of a biogas fuelled Combined Heat and Power (CHP) engines and dual fuelled boilers for the generation of electricity and heat at the site, (which are classified as 'existing' combustion sources under the Medium Combustion Plant Directive), although already permitted will be classified as a directly associated activities to this main listed activity.

The STC treats both indigenous sludges and imported sludges. Indigenous sludge is generated from the incoming flow to the STW, which passes through the aerobic treatment process under the UWWTD. Sludge is pumped to the Primary and SAS Buffer Tank via Sludge Screens. Sludge is then thickened using four drum thickeners, with filtrate draining to a pumping station before it is returned to the UWWTD processes for additional treatment. Thickened sludge is then pumped to the Thickened Sludge Buffer Tank and fed the three Primary Digester Tanks by digester feed pumps.

Imports of sludge from other works areis delivered to a sludge offloading point and Sludge Import Tank from tankers, is screened and pumped to the Primary and SAS Buffer Tank. All such imports are subject to appropriate waste pre-acceptance and acceptance checks, prior to acceptance. Indigenous sludge and imported sludge combine in the Primary and SAS Buffer Tank and are pumped to sludge thickening plant, as described above.

There is also an offloading point at the STC for permitted imported tankered wastes at the inlet of the sewage treatment works. The waste arrives at the STC via tanker vehicles and is discharged directly to a subsurface chamber where it combines with the low-level sewer and is pumped to the inlet, where it combines with other sewer derived materials and subject to aerobic treatment, under the UWWTD. Imported sludge can also be discharged directly into the inlet as required.

All imports will be assessed using the Thames Water standard waste pre-acceptance checks to ensure that they are appropriate for treatment via the UWWTD. Once pre-approved as suitable for treatment via the UWWTD route, the waste carriers are approved. Wastes will be subject to appropriate waste acceptance checks in accordance with Thames Water procedures'. Incoming tanker vehicles are directed to the inlet offloading point, which is an impermeable surfaced area, equipped with sealed drainage.

The Head of Works import is located upstream of the rag and grit screens and storm offtake and discharged wastes are passed from tankers to the urban waste water treatment processes.

Following treatment over an appropriate number of days within the Primary Digesters, digested sludge gravitates to Secondary Digester Tank number 4 and then Secondary Digester Tank number 2, which operate in series. Sludge is held in the Secondary Digester Tank for an appropriate retention time to

ensure that the required level of pathogen kill is achieved in order to comply with the digested sludge cake output quality requirements. Sludge is then pumped to the Sludge Buffer Tank, prior to being pumped to the digested sludge dewatering plant for dewatering.

During abnormal operations of the digested sludge dewatering plant, digested sludge automatically diverts into the Emergency Sludge Storage Tank and is automatically returned to the Sludge Buffer Tank under normal operations.

Dewatered digested sludge is deposited into the cake barn and dewatering filtrate is returned to the STW for additional treatment via the site drainage and a Liquor BufferTank. Digested sludge cake is stored on the cake barn prior to removal from the site, or, transferred to the second cake barn. Digested sludge cake is then removed from the site under the Sludge Use in Agriculture Regulations (SUiAR)1989, and in accordance with the Biosolids Assurance Scheme (BAS).

Biogas from the Primary Digester Tanks and Secondary Digester Tanks is captured within roof mounted gas holders for storage. There is a roof mounted biogas holder at the top of each of the Primary and Secondary digester tanks. The biogas transfer pipeline is above ground and 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. Each of the biogas holders is fitted with pressure release valves (PRVs) as a safety precaution in the event of over pressurising the system.

The biogas is taken from each biogas holder and joins a common biogas line before it is transferred via boosters for combustion in the CHP engines, generating electricity for use both within the site and for export to the grid. Heat generated by the CHP engines is used to maintain primary digester tank temperatures via heat exchangers.

In the event there is excess biogas, i.e. more than the CHP engines or boilers can utilise, or in the event that the CHP engines or boilers are unavailable, there are two ground mounted biogas flares.

Thames Water imports treated sludge cake from other works, for temporary storage within the two cake barns, pending offsite recovery. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import, including checking whether the incoming cake complies with the requirements of SUiAR and BAS.

Imported treated sludge cake is offloaded into a dedicated area within one of the cake barns, so as to be stored separately to indigenous sludge cake. The waste stream is the same as that arising from the treatment of sludge within the Beddington 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 engineered surface within the cake barn, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

3 Site Management Responsibilities and Procedures

3.1 Site Roles

Figure 3.1 - Site Roles

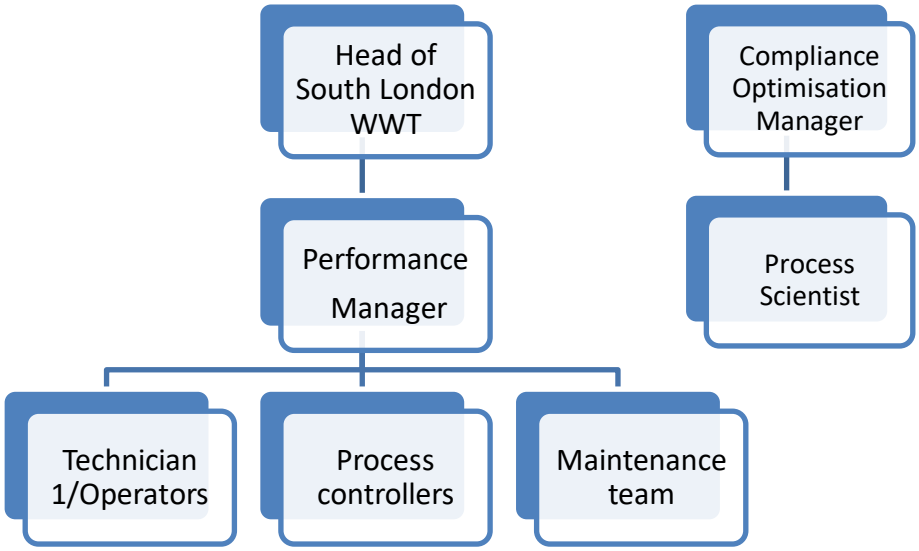


Table 3.1 - Tasks and Responsibilities

Role	Tasks and Responsibilities
Regional Operations Manager	Responsible for the overall performance of STW in this region.
Area Operations Manager	Responsible for overall performance of the STW in the area, including assessing the scope of, 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 staff 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.
Process and Maintenance Technicians	Day to day duties include maintaining and operating process equipment.
Customer and Stakeholder Manager (CSM)	Responsible for managing liaison with all external customers and stakeholders in liaison with customer centre, escalation team, local govt. liaison team etc.
Compliance and Optimisation Manager	Responsible for process investigations and technical assistance.
Process Scientist	Reports to Compliance and 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.

Role	Tasks and Responsibilities
Customer Centre	Responsible for receiving all customer calls, logging them and passing them to the appropriate operational departments.

The site is manned 24 hours per day and 7 days per week.

3.2 Key Contacts

Role	Name	Email address	Phone Number
Head of South London Waste Treatment	[redacted]		
Performance Manager			
Customer Centre			
Technically Competent Manager			

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 Beddington 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 Odour Sources, Critical Issues and History

2018-2021 the site received 3 odour complaints. 25 odour complaints were formally recorded in 2022 all of which were received between mid-July-mid August. This was due to the primary digesters going 'sick'. Recovery takes a number of weeks due to the long retention periods, and the resultant odorous digested sludge caused the smell complaints.

An Odour Risk Assessment is included as Appendix 1.

An Odour Improvement Plan is included as Appendix 2.

Critical Odour Issues, Emergency Response and Mitigation Measures are summarised in Tables 4.2-4.6.

4.2 Identification of Odour Critical Plant

4.2.1 Odour Risk Assessment

The Odour Risk Assessment is not a 'one-off' exercise but an on-going process. The Odour Risk Assessment should be reviewed whenever the site undergoes an operational or capital change which could significantly affect odour.

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 Beddington 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:

- General
- Incoming Sewer / Banana chamber
- Cess Reception, washdown and drainage
- Main pumping station wet well
- Screening
- Skips - Washpactors
- Screening handling - skip compactors
- Grit Removal Equipment – Detritor
- Grit Skips
- Storm Tanks
- Primary Settlement Tanks
- Fats, Oil & Grease Scum Removal System
- Primary Raw & SAS Transfer Pumping
- Activated Sludge Plant Lanes & Zones
- Final Settlement Tanks
- Filtration – Disc Filters
- Final Effluent

The following list of potential odour sources under the Sludge Treatment Centre Permit have been identified during the risk assessment:

- Sludge Import
- Cess Reception, washdown and drainage
- Primary & SAS raw sludge screening
- Primary & SAS raw sludge screening - Skips
- Primary Raw Sludge Thickening & Pumping
- Return Liquors
- Primary Digestion
- Secondary digestion
- Beltpresses
- Liquor buffer tank
- Emergency sludge storage tanks
- Cake Barn including cake imports
- Vehicle Movements
- Waste Gas Burner
- OCU

4.2.3 Odour Critical Plant

The following list of odour critical plant[1] that has been identified during the risk assessment:

- Storm tanks
- Primary settlement tanks
- Primary raw transfer pumping
- Primary raw sludge screening – Skips
- Primary raw sludge thickening & pumping
- Return Liquors
- Primary digestion
- Cake barn
- Waste Gas Burner – Flare stack gas
- Odour control unit

4.2.4 Waste Storage for Sludge Treatment Centre Permit

Table 4.0 Sludge Treatment Centre Permit Tank Inventory

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.

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.

Tank Purpose	Number	Operational Volume (m3)	Construction	Average Retention Time under normal operations
Primary + SAS Buffer Tank	1	443	Steel	8.5 hours
Sludge import tank	1	157	Steel	<2.5 days
Thickened Sludge Buffer Tank	1	471	Steel	19 hours
Primary Digester Tank	3	5,700	Concrete	20 days
Overflow tanks	2	25	Plastic	N/A (abnormal operation)
Secondary Digester Tank	2	3,800	Concrete	13 days
Sludge Buffer Tank	1	312	Steel	11 hours
Emergency Sludge Storage Tank	1	2,750	Steel	N/A (abnormal operation)
Liquor Buffer Tank	1	350	Steel	Approx 18 hours
Digested Sludge Poly Silo	1	24 tonnes	Steel	Approx 4 months
Diesel Tank	2	100,000 litres	Steel	>1 year

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 imports)	Cake Barn(s)	3,510 m3	30 days	19 06 06	Diffuse	Low
Biogas	Roof mounted gas holders on primary digesters; see air emissions plan.	Digester roof storage	Continuous operation	N/A	Point Source	Low
Liquor	Liquor balancing tank and site wide drainage system	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	16 10 02	Diffuse	Low
	Liquor return pumping stations	Continuously pumped to head of works	Continuously pumped to head of works	16 10 02	Point source (see OCU Entry)	Low/medium
Raw imported sludge	Sludge import tank	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	19 08 05	Diffuse	Medium/High
Indigenous Sludge (primary/SAS)	Primary sludge buffer tank	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	19 08 05	Point Source (see OCU entry)	Medium/High
Thickened sludge import	Sludge import tank	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	19 02 06	Diffuse	Medium/High

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 screening skips	Before primary sludge buffer tank	3 skips	Removed by framework contractor within 4 days when full	19 08 01	Diffuse	Low
Odour Control Unit	See section 5.1.2	See Section 5.1.2	NA	NA	Point Source	Low/medium

Table 4.2 Odorous raw materials for Sludge Treatment Centre Permit

Raw Material	Odorous	Storage	Mitigation	Odour Risk
Sludge Polymer Flopam EM640LH	Not odorous	2,000L stored in 1,000L IBCs on portable bunds	Contained with lid	Low
Anti-foam Flofoam H16F	Not odorous	3,000L stored in 1,000L IBCs on portable bunds	Contained with lid	Low
Sludge polymer Flopam FO5465AF	Not odorous	24 tonnes stored in a bunded silo.	Contained with lid	Low
WP White Diesel	Petroleum	1,250 litres in a double skinned day tank	Contained with lid	Low
Lubricating oils Mobil Pegasus 605 Ultra, Mobil Pegasus 610	Solvent	Three separate tanks totalling 8,300 litres for clean oil. Three separate tanks totalling 8,300 litres for waste oil. Stored in double skinned tanks.	Contained with lid	Low
Glycol coolant Texaco Delo XLC Antifreeze/Coolant - Premixed 40/60	Solvent	6,000 litres stored within 6x 1,000 litre IBCs on portable bunds	Contained with lid	Low

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

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'.

The routine operational tasks carried out at Beddington STW to specifically mitigate against generation of odour are listed in the above SOM. Specific odour control measures include an odour control unit. In addition, iron dosing is primarily used for phosphorus removal, however, has the added benefit of reducing odour from the PSTs and sludge processes.

4.3.1 Odour Control Units

There is one Odour Control Unit. This is a package plant provided by Bord na Mona including a biofilter followed by activated carbon. The Odour Control Unit equipment status is shown on SCADA. The media in the biofilter is lava rock.

The Odour Control Plant treats foul air from the sludge import tank, Primary and SAS Sludge buffer tank, the thickening plant, the thickened sludge buffer tank, and liquor return pumping station 1. Duty / Standby Odour Control Fans pull the foul air through the dual biofilter and activated carbon filter and discharge the treated air through an outlet stack. The biofilter is continuously irrigated using a water spray from the wash water system.

OCU is serviced monthly by a contractor.

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 Beddington STW are summarised in the tables below.

The routine operational tasks carried out at Beddington 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 Tables 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.

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

Process	Odour and offensiveness	Specific Tasks	Responsibility	Monitoring	Task/check frequency	Trigger for action	Remedial action and timescale
General	Low	Housekeeping - keep site clean and tidy. Any spillages significant enough to cause odour emission 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.	Tech 1	Visual Inspection	Daily	Spillage that would lead to odour	Clear up as soon as possible – within one day

Cess Reception Linked tasks specified in Section 2.1 of appendix 6	Medium	Covered. Ensure tankers coupled correctly	Tech 1	Visual	Daily	Spillage that would lead to odour	Clear up as soon as possible – within one day
Works inlet	Low					NA	NA
Main pumping station wet well	Sewage and return liquors - Low	Covered	Tech 1	Visual	Daily	NA	NA
Screening Linked tasks specified in 2.3 of appendix 6	Sewage - Low	Clean plant internally and externally when taken out for service Covered	Tech 1	Visual Inspection	As required	Additional odour created due to static sewage	Ensure screen well fully pumped out and washed down
		Regularly remove from site the screening skips of the Washpactors - A contractor comes within 2 working days once called.	Tech 1	Visual Inspection	Call off order Monday, Wed & Friday		
		Regularly remove from site the raw sludge screenings skips	Tech 1	Visual Inspection	As required		
Skips – Washpactors Linked tasks specified in 2.5 of appendix 6	Sewage / Rag - Low	Covered skips, 2 times a week removed.	Tech 1	Visual	Daily	Failed washpactor – manually deposit screenings on pad	Raise job with M&E. Remove screenings asap into skip and remove from site
Screening handling - skip compactors Linked tasks specified in 2.4 of appendix 6	Sewage / Rag – low	Covered	Tech 1	Visual	Daily	Failed compactor – manually deposit screenings on pad	Raise job with M&E. Remove screenings asap into skip and remove from site

Grit Removal	Sewage / Grit - Low	Regularly remove from site the grit skips – The contractor comes within 2 working days once called.	Tech 1	Visual Inspection	2 or 3 times a week	Unable to collect skip in required time	Arrange for alternative removal within 3 days
	Sewage / Grit - Low	When detritor is taken out of service empty and clean as soon as practicable to remove all rag and grit build up	PCE/Tech 1/	Visual Inspection	The same day after being taken out of service	Detritor not draining allowing septic sewage	Jet line to clear within 3 days
			Team Manager				
Storm Tanks Linked tasks specified in 2.6 of appendix 6	Sewage – Medium	Empty & scrape clean tanks as soon as practicable after a storm.	Tech 1	Visual Inspection	ASAP	Failed scrapers	Raise job within 1 day with M&E to rectify.
		Check tanks have emptied correctly after storm and log	Tech 1	Visual Inspection	The same day after emptying	Tank(s) not draining	Investigate – raise job with M&E if required within 1 day
		Potential to contract clean	Tech 1	Visual	As required	NA	NA
Flow & Distribution to Primary Settlement Tanks	Sewage - Low	Daily checks	Tech 1	Visual	Daily	Accumulation of excessive debris	Remove to skip within 1 week
Primary Settlement Tanks Linked tasks specified in 3 of appendix 6	Sewage - Medium	Remove any build-up of scum or rag on tank surface, weirs or launder channels that may result in odour emission	Tech 1	Visual Inspection	Weekly	Failed scum scraper	Raise job with M&E within 3 days
		Monitor sludge blanket depths. Refer to **Note 1**. Record values on site log sheet and on Cockpit. Keep sludge blanket level correct, monitored as part of the effluent rounds. Manual measurement taken. Target level .25m as detailed in the SOM	Tech 1	Blanket level detector	Minimum twice weekly	Failed desludge pump	Valve to use pump on adjoining tank. Raise job with M&E within 1 day

		Preferentially de-sludge tanks with high levels of sludge. In extreme cases shut tank in and drain down.	PCE/Tech 1	Visual	As required	Failed desludge pump	Valve to use pump on adjoining tank. Raise job with M&E within 1 day
		Check and clear blockages in scum removal system	Tech 1	Visual	Minimum weekly	Failed scum scraper	Raise job with M&E within 3 days
Fats, Oil & Grease Scum Removal System	Sewage – Medium	Daily checks on primary treatment round	Tech 1	Visual	Daily	Failed scum scraper	Raise job with M&E within 3 days
Primary Raw Transfer Pumping	Raw sludge - Medium	Daily checks on primary treatment round	Tech 1	Pumps monitored on SCADA - flow rate and when it is running. Target level .25m, trigger level .5m	Continuous Daily	Failed desludge pump	Valve to use pump on adjoining tank. Raise job with M&E within 1 day
Flow & Distribution to Secondary Treatment	Settled sewage – Low	Runs in covered channels	Tech 1	Visual	Daily	NA	NA
Activated Sludge Plant Lanes & Zones Linked tasks specified in 4 of appendix 6	Activated sludge -low	Iron dosing to reduce H2S level on settled sewage	Tech 1	Qualitative assessment	As required	Failed ferric dosing	Investigate and rectify within 1 day

Final Settlement Tanks Linked tasks specified in 5 of appendix 6	Final Effluent - Low	Tanks checked on secondary treatment rounds	Tech 1	Visual	Daily	Failed scraper	Investigate. Raise job with M&E within 1 day
RAS Chambers & Pumping	Activated Sludge -Low	Covered	Tech 1	Visual	Daily	Accumulation of sludge crust on surface	Hose down within 1 week
Filtration – Disc Filters Linked tasks specified in 7.2 of appendix 6	Final Effluent - Low	Covered	Tech 1	Visual	Daily	Failed disc filter	No impact on odour

Table 4.4: Summary of routine odour mitigation tasks for assets under Sludge Treatment Centre Permit

Process	**Odour and offensiveness**	**Specific Tasks**	**Responsibility**	**Monitoring**	**Task/check frequency**	**Trigger for action**	**Remedial action and timeframe**
General	Low	Housekeeping - keep site clean and tidy. Any spillages significant enough to cause odour	Tech 1	Visual	Daily	Spillage leading to significant odour release	Clear up within 1 day

		emission 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.					
Sludge Import Linked tasks specified in 1 of appendix 7	Medium	Covered. Ensure tankers coupled correctly	Tech 1	Visual	Daily	Spillage leading to significant odour release	Clear up within 1 day
Cess Reception Linked tasks specified in 2.1 of appendix 6	Medium	Covered. Ensure tankers coupled correctly	Tech 1	Visual	Daily	Spillage leading to significant odour release	Clear up within 1 day
Primary & SAS Raw Sludge Screening Linked tasks specified in 2 of appendix 7	Raw Sludge - Low	Enclosed units and odour controlled	Tech 1	Visual	Daily	Maintenance requiring unit to be opened, exposing sludge	Ensure washed down properly to prevent odour release prior to maintenance work
Sludge Thickening Plant (STP)	Raw sludge – Low	Ensure skips are emptied regularly	Tech 1	Visual	As required	Skip not collected in good time leading to spillage	Clear up spillage into other skip and arrange

							collection within 2 days
		Ensure hatches/covers are kept closed except during inspections and serviced by OCU	Tech 1 SCADA	Visual	Daily Continuous	Hatches left open	Close hatches
		Clean up spillages without delay	Tech 1	Visual	ASAP	Excessive spillage leading to escalated odour risk	Arrange within 1 day tanker/jetter to deal with larger spillage
Digester Area Linked tasks specified in 6 of appendix 7	Sludge – low	Clean any spillages as soon as practicable.	Tech1	Visual	As soon as possible	Excessive spillage leading to escalated odour risk	Arrange within 1 day tanker/jetter to deal with larger spillage
		Ensure digester mixing system is operating correctly	Tech 1	Visual	Daily	Failed mixing pump	Investigate. Raise job with M&E within 1 day
		Monitor digester temperatures – trended and recorded on Cockpit. Digesters are sampled twice weekly and analysed to various	Tech 1 / PCE	Qualitative Assessment	Daily	Temperature above 40C or below 32C – only likely due to lengthy failure of heating/control system	Heating failures identified and job raised to M&E as appropriate

		determinants including dry solids and pH					within 3 days
		Monitor bell heights through SCADA and manage to prevent gas leaks, flare off gas if necessary. Refer to **Note 2**	PCE	SCADA	Daily	Excessive bell height leading to potential or actual gas emission	Manage operation of flare to control (PCE)
		Check for gas leaks in general	Tech 1	Visual	Daily	Leak found	Inform Site Manager who will decide on course of action – within 1 hour
		Periodically test and maintain pressure relief valves.	Tech 1 Maintenance technical Co-Ordinator	Qualitative Assessment	**Operational plan**: 3 Monthly **Maintenance plan**: 12 monthly	**NA**	**NA**
Primary Digestion Linked tasks specified in 6 of appendix 7	Digested sludge - Medium	2 floating roofs, 1 membrane roofs. Daily checks. PRVs monitored by SCADA. Temp, feed per day, gas quality and lab samples monitored daily. Membrane roofs connected to biogas system. Monitored on SCADA. Daily	Process controller / Tech 1	SCADA	Daily	See above notes relating to temperature and roof monitoring	See above notes relating to temperature and roof monitoring

		checks of digestion process.					
Secondary Digestion Linked tasks specified in 7 of appendix 7	Digested sludge - Low	Covered	Tech 1	Visual	Daily	NA	NA
Beltpresses	Digested sludge - low	Covered, cake discharged to covered storage area, regular cleaning and maintenance	Tech 1	Visual	Daily	Covers left off/damaged	Replace covers. Raise job within 3 days if repair needed
Sludge Dewatering Linked tasks specified in 12 of appendix 7	Digested Sludge - Low	Check belt presses are working correctly. Daily checks sludge round 3 - dewatering round. Pumps monitored via SCADA	Tech 1	Visual Monitored by SCADA	Continuous Daily	NA	NA
		Hose unit down if out of use	Tech 1	Visual	As required	NA	NA
		Beltpresses covered. Cake discharged to covered storage area.	Tech 1	Visual	Daily	Covers left off/damaged	Close covers. Raise job within 3 days if repair needed

		Regular cleaning and maintenance of beltpresses.	Tech 1	Visual	Daily	NA	NA
Sludge Storage & Movements Linked tasks specified in 16,17 of appendix 7	Digested sludge cake - low	Ensure no more than 1170 m^3 sludge stored in the 10 day cake barn (planning condition 9)	Biorecycling Team	Visual	Daily	Excessive cake stored (due to inability to remove)	Inform EHO. Arrange for contingency (eg intersite)
		Ensure no more than 2340 m^3 sludge stored in the 20day cake barn (planning condition 9)	Biorecycling Team	Visual	Daily	Excessive cake stored (due to inability to remove)	Inform EHO. Arrange for contingency (eg intersite)
		No sludge cake to be stored other than on the cake barn (planning condition 8)	Biorecycling Team	Visual	Daily	NA	NA
		Covered vehicles, movements kept to a minimum. Roof of cake barn partially enclosed.	Tech 1 Biorecycling Team	Visual	As required	NA	NA
Digested sludge buffer tank	Digested Sludge - Medium	Check correct operation of automatic tank drainage tank (to prevent accumulation of solids)	Tech 1	Visual	Weekly	NA	NA

		Covered, cake discharged to covered storage area, regular cleaning and maintenance					
Return Liquors	H2S - High	Covered and odour controlled, daily checks as part of the sludge rounds.	Tech 1	Visual	Monitored by SCADA	NA	NA
Emergency sludge storage tank	Digested sludge	Keep empty unless in use				Sustained high level in tank leading to potential odour issue	Reduce tank sludge level, address root cause within 1 week
Liquor buffer Tank	Ammoniacal - Low	Daily checks sludge round 3 - dewatering round. Pumps monitored via SCADA	Process Controller / Tech 1	Visual SCADA	As required Continuous	NA	NA
Primary raw sludge screening - Skips	Raw sludge - Medium	Regular removal of skips	Tech 1	Visual	As required / once every 2 weeks	Skips not collected – excessive storage of screenings	Arrange for removal within 3 days
Cake Barn Linked tasks specified in 16,17 of appendix 7	Digested sludge cake - low	Cake in storage forms a crust after a day or two reducing risk of odour. No additional turning or handling during cake storage. Roof	Tech 1/biorecycling	Visual	Daily	See Sludge Storage & Movements entry	NA

		and walls provides wind barrier.					
Cake Barn (cake imports)	Digested sludge - low	Cake in storage forms a crust after a day or two reducing risk of odour. No additional turning or handling during cake storage. Subject to pre acceptance checks. Tipper truck drop height less than 2m. Roof and walls provides wind barrier.	Tech 1/biorecycling	Visual	Daily	See Sludge Storage & Movements entry	NA
CHP Linked tasks specified in 9 of appendix 7	Combusted biogas - low	Site rounds	Tech 1	Visual	Daily	NA	NA
Waste Gas burner Linked tasks specified in 10 of appendix 7	Combusted biogas - low	Site rounds	Tech 1	Visual	Daily	Failure leading to potential biogas release	Raise job with M&E within 1 day
Odour Control Unit Linked tasks specified in 9 of appendix 6	Earthy- low	Monthly inspections by specialist contractor and daily site rounds.	Tech 1/Specialist contractor	Daily/Monthly		Failure of unit/irrigation/other cause	Raise job with M&E within 1 day

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

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Incoming sewer / banana chamber	Storm tank returns	Planned	None	Normal operation after storm	Low
Cess Reception	Spillage	Rare	Clean up ASAP	Clean up within 1 day	Medium
Primary Settlement Tanks	Scraper failure	Rare	In case of bridge/scraper failure for more than 48h, drain and hose down tank. If the scraper failure cannot be rectified within two working days, the tank will be drained and clean until repair can be done. If a desludge pump fails, a standby pump is available on site and can be used.	Sewage or sludge left in tank will become odour source. Important not to leave.	High
Main pumping station wet well	Failure of PS	Rare	Investigate and rectify	Prolonged failure – can use storm tanks as temporary storage but requires authorisation	Low
Main pumping station wet well	Build-up of fat and debris	Rare	Clean the well up	Minimal impact as mostly covered.	Low
Storm Tanks	Tanks draining down	Planned	None	None	Low
Storm Tanks	Scraper failure	Rare	Investigate cause and rectify. In the event of a scraper failure, meaning the tanks cannot be scraped when required to be drained we will risk assess, and consideration will be given to hiring in contractors to clean tanks.	As per mitigation	High

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Storm Tanks	Unable to return storm contents	Rare	Overpump sludge to inlet	Extremely unlikely scenario	High
Storm Tanks	Residual solids in storm tanks in hot weather	Rare	Timely operation of scrapers and draining tanks down	Consider hosing down to keep wet	High
Screening	Screen open for maintenance	Planned	Find cause and resolve	Ensure screen sump pumped out and washed down if long term	Low
Screening	Blockages	Frequent	Clear blockage	Use jetter	Low
Open skips - Washpactors	Excessive amount of rag / Hot weather	Rare	Removal of skip	Ensure skips removed in timely manner	Medium
Screening handling - skip compactors	Changing skips	Planned	Only removed from site immediately when changed	Normal operation	Medium
Screening handling - skip compactors	Spillages	Frequent	Clean up any spillages as soon as possible (including rag during skip changes)	Within 1 day	Medium
Grit skips	Skips not collected by contractors	Rare	Chase contractor, contacted by phone and can arrive the next day	As per mitigation	Medium
Primary Settlement Tanks	Hot weather	Rare	Consider increase of iron dosing	Dosing rate already removes virtually all H2S	High

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Primary Settlement Tanks	High blanket level	Frequent	Maximise sludge processing capacity and tanker as a last resort	Preferentially desludge any high tanks - PCE	High
Primary Settlement Tanks	Tank drained down	Planned	Hose down	Within 3 days if long term outage	High
Primary Settlement Tanks	Pump failure	Rare	If the primary raw sludge pumping fails, a standby pump is available on site and can be used.	PCE makes change over on SCADA	High
Fats, Oil & Grease Scum Removal System	Blockage	Frequent	Jet the trap	If excessive build up, clear within 3 days	Medium
Primary Raw Transfer Pumping	Failure / Blockage: high blanket level in PSTs	Rare	Investigate cause and rectify / Unblock/ Process controller to make adjustments on SCADA to desludge time		Medium
Activated Sludge Plant Lanes & Zones	Lane drained down	Planned	Hose down the lane	Very infrequent, circa 8 years	Medium
Final Settlement Tanks	Tank drained down	Planned	Hose tank down	Within 3 days if long term outage	Medium
Final Settlement Tanks	Bridge / Scraper failure	Rare	Hose tank down / Find cause and resolve	Within 3 days if long term outage	Medium
Filtration - Disc Filters	Drained down for maintenance	Planned	Hose it down	Virtually no impact on odour	Low

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Final Effluent	Discharging from storm tanks	Rare	None	None possible, very low impact	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	Odour risk after mitigation
Cess Reception	Spillage	Rare	Clear up ASAP	Within 1 day	Medium
Sludge import	Spillage	Rare	Clear up ASAP	Within 1 day	Medium
Primary raw & SAS sludge screening	Unit open for maintenance	Planned	Clean down unit	Ensure done at start of job	Medium
Primary raw & SAS sludge screening - Skips	Hot weather	Rare	Replace skip, take old one off site. Hose down area to clear up fallen material. Skips to be removed the next day.	As per mitigation	High
Primary raw & SAS sludge screening - Skips	Skips not collected by contractors / Overflowing	Rare	Clean up and chase contractors	As per mitigation	Medium
Primary Raw & SAS Sludge Thickening & Pumping	Open for maintenance	Planned	Clean down	Ensure done at start of job	Medium
Primary Raw & SAS Sludge Thickening & Pumping	Sludge spillages	Frequent	Wash down	Within 3 days	Medium

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Primary Raw & SAS Sludge Thickening & Pumping	Failure	Rare	By-Pass	No impact on odour	Low
Return Liquors	Covers / hatches left open	Rare	Close hatches	As per mitigation	High
Primary Digestion	Failure of digester mixing leading to poorly digested and odorous sludge on cake pad	Rare	Process monitoring. Find cause and rectify.	Consider more frequent cake removal/odour masking	Medium
Primary Digestion	Temperature out of range leading to poor treatment and odorous sludge on cake pad	Rare	Process monitoring / Find cause and rectify. If necessary tanker sludge from site.	Consider more frequent cake removal/odour masking	Medium
Primary Digestion	Overfeeding of digester leading to poor treatment and odorous sludge on cake pad	Rare	Process monitoring / reduce feeding rate. If necessary tanker sludge from site	Consider more frequent cake removal/odour masking	Medium
Primary Digestion	Significant release of biogas	Rare	Engines, CHP units, gas storage and flare stack are available tp prevent significant biogas release. Process monitoring / Find cause and rectify	Raise notification to EA as required under permit, if applicable	High
Primary Digestion	Sludge spillages	Rare	Clean up	Within 3 days if outside	Medium
Primary Digestion	Decommissioning digester	Planned	Carried out as a dedicated project - odour risk is considered as the planning process	As per mitigation	Medium
Secondary Digestion	Decommissioning digester	Planned	Carried out as a dedicated project - odour risk is considered as the planning process	As per mitigation	Medium
Beltpresses	Failure	Rare	Use stand-by unit and/or emergency storage tank. Contact service from Brettex, arrival the next day	Low impact unless emergency tank full	Low

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Beltpresses	Maintenance	Planned	Contact service from Brettex, arrival the next day	As per mitigation	Low
Beltpresses	Spillages	Rare	Clean up	Within 3 days – low impact	Medium
Emergency sludge storage tank - digested sludge	Used	Rare	Drain tank back to process as soon as possible	As per mitigation	Medium
Cake barn	Moving cake	Frequent	Minimise movements		Medium
Cake barn (including cake importing)	Excess cake stored	Rare	Manage cake stock. Ensure no more than 1170 m3 sludge stored in the 10 day cake barn (planning condition 9), Ensure no more than 2340 m3 sludge stored in the 20day cake barn (planning condition 9). No sludge cake to be stored other than on the cake pads (planning condition 8). If necessary, truck excess sludge from site.	Implement action plan with Biorecycling. Inform EHO if cannot meet planning condition	Medium
Cake barn	Poorly digested sludge leading to odorous cake	Rare	Remove from site/ Use odour suppressant spray systems to control odour	As per mitigation. Inform EHO	High
Vehicle Movements	Sludge on wheels / Failure of wheel wash	Rare	Find cause and rectify	Raise job with M&E within 3 days	Low
Waste Gas Burner - Flare stack gas	Failure of both CHP plant and flare stack allowing gas to escape from digesters	Rare	Repair failure. Two flares on site. PCE to contact waste operation control centre, CHP team then contacted. Critical spares are held on site.	Inform EA as per Permit	High
Odour Control Unit	Failure	Rare	Two stage treatment and continuous monitoring of outlet concentration with alarm settings. Investigate and rectify Standby fan built into the unit.	As per mitigation	Medium

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Odour Control Unit	Maintenance	Planned	Parallel bio filters so that one unit can provides treatment during carbon media replacement	Monthly service contract in place	Medium

Table 4.7: General Intermittent, abnormal, and emergency events

Incidents and emergencies	Event	Status	Ops mitigation	Expansion of TWUL operational response	Odour risk after mitigation
Fire	Failure of OCU 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 storage on site.		Low
Flooding	Flooding causing process or equipment problems	E	Not an identified problem at Beddington. 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.		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 storage on site plus additional storage in the existing sludge holding tanks. Transport to other STWs if necessary		Low

Note 1

Sludge dips are carried out by technicians using a blanket level detector and reported to the Process Control Engineer (PCE), who will decide what action to take.

The target operating level is (0.5m) average across all tanks and the maximum level is (1.0m).

The trigger levels are summarised in Table 4.2:

Table 4.7 - Monitoring of the sludge blanket level in the PSTs

Normal	Trigger
(0 – 0.5m)*	< or equal to 0.25 m – no sludge blanket (no action required) >0.25m – adjust PST de-sludge pump run time (> 1.0m) – Inform Performance Manager

**Measured as depth of sludge in the tank.*

Note 2

The bell heights are actively controlled using actuated valves to even out the levels as much as possible. The averaged bell height reading (in % of maximum height) is used to control the start and stop operation of the flare, such that the risk of losing gas to atmosphere from the bell skirts is minimised, whilst maintaining acceptable buffer capacity of gas storage for running the CHP engines.

4.3.3 Spillages

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 inspections rounds, which apply to Thames Water large STW sites, and have been included in Appendices 6 and 7, 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 fault needs to be logged and reported for follow up maintenance/repair.

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 Beddington 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. Beddington fits into the first row of the table.
- Dry solids feed: see table below, Beddington 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 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.

We aim to ensure a robust process is in place for investigation of complaints (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.

Sniff Testing

Sniff testing has been incorporated into our Odour Improvement Plan (Appendix 2). This is to allow time to ensure that the most effective sniff testing can be carried out using personnel not sensitised to smells on site.

The procedure will be undertaken in response to complaints or if a risk of odour nuisance at sensitive receptors is expected and/or has been substantiated.

- Sniff testing will be carried out at by someone not routinely based at site, who are less sensitised to odour produced on site.
- Assessing potential odour sources within the Urban Waste Water Treatment (UWWT) and Sludge Treatment Centre (STC) processes and attempt to trace the odour to its source.
- The procedure and recording form which will be used can be found in appendix 9 of the OMP.

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

4.4.1 Site Perimeter Odour & Weather Monitoring

Odour Monitoring

Dedicated site wide Odour monitoring stations are installed to monitor the following:-

- North Boundary – Located Top of Storm Tanks
- South Boundary – Located in Dewatering Main MCC Kiosk
- East Boundary – Located in Potable Water Booster Kiosk
- West Boundary – Located in the FE Booster Kiosk Area

Samples from the respective boundaries are pulled, via a dedicated pump to their respective instrumentation cabinet. After analysis via sample pump and counter/current drier the reading displayed locally.

H_2S monitors at the site perimeter are serviced every 6 months by Pollution monitors.

4.5 Record Keeping

Records of routine monitoring, site and sludge inspection rounds and sludge blanket checks are kept on SAP. 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 team manager by the contractor and stored on SharePoint.

4.6 Emergency Response and Incident Response Procedures

Emergencies such as fire, flood and severe weather are managed by Thames Water's Incident Management and Business Resilience team. The processes employed can be found on Thames Water's SharePoint site and are entitled: 'Security and Emergency Risk Management Process' and 'Event Management Procedure'. . This is a company confidential document and therefore, is 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 Safety, Health & Wellbeing team.

In the event of power failure, the whole site will run on generators.

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

Odour mitigation for emergency events have been detailed in Tables 4.5 - 4.7. The purpose of Tables 4.3 - 4.7 shall be to identify site specific emergency response procedures and mitigation measures relating to site odour generation and release as well as additional site-specific odour issues and mitigation measures associated with process stages identified under the site Odour Risk Assessment.

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
(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 digester tanks on the basis that increased temperatures give greater potential for volatilisation of odours (This connects to the 'Secondary digester' entry in Table 4.4 *but in the context that raw sludges have greater odour potential)*
(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 4.2.3 above.

All maintenance is captured on the corporate system SAP, which generates work requests for the various activities for the treatment process assets.

5.1.2 OCU selection and performance validation

OCU 1 – sludge pre thickening.

Biofilter

Original Manufacturer	Monashell APC System
Year of installation	2014
Height Width Length	2450mm x 3650mm x 2450mmH
Media type	Lava Rok
Design Air flow rate	1,430 Am3/hr (Φ225mm inlet duct)
Design H2S Inlet Load	1 ppm (average) 10 ppm (max)
Design inlet temp	20
Design removal efficiency	98%
Irrigation type	Constant

Carbon filter

Height Width Length	Ø1,1000 mm x 1,750 mmH
Design airflow rate	1,430 Am3/hr
Design H2S Inlet Load	0.02 ppm (average) 0.2 ppm (max)
Design inlet temp	20
Design removal efficiency	99%

Design parameters back calculated by ERG

This was installed circa 2014 with modifications circa 2019
For continuous operational monitoring, system incorporates:

- Visibility of fans on SCADA, with alarms, for loss of extraction from odorous sources
- Continuous discharge H2S monitoring capability and alarms
- High OeU exhaust stack alarm
- Low air flow alarm

For period 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 H2S removal. Should this occur, ERG would include this in the 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.

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 and Equipment Maintenance Standards. This is either delivered in house by Operations or outsourced to a contractor. Refer to the Odour Control Unit Asset Standard and Site Operating Manual for more information.

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)	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	6 monthly	X	X	X
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

*Only required on OCUs covered by STC permit

Condition of the media in the OCU is monitored by performance checks and by additional testing as required.

The OCUs at Beddington STW are covered by a service and maintenance contract with a specialist Contractor. They are inspected on a monthly basis and reports are sent to site management. Appendix 8 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.

The hydrogen sulphide concentration at the exhaust of the OCU is continuously monitored through the SCADA system. The hydrogen sulphide monitors are also serviced by a specialist contractor on a monthly basis.

H_2S Monitor	H_2S
High Alarm	500oum$^{3-1}$/0.25ppm
High High Alarm	1000oum$^{3-1}$/0.5ppm

The OCUs 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 a biofilter to achieve a minimum of 95%, removal efficiency. A minimum of 2-3 seconds retention time for a carbon filter is stipulated.

H2S readings are reported in the monthly service reports which inform odour equivalents (OEs). The accepted OEs for H2S at 0.5 part per million is equivalent to 1,000 odour units. A "red action" would be raised for any value 3 parts per million or greater on the discharge from the biofilter (before the carbon filter) and 0.5 parts per million off the subsequent carbon filter. There is a relationship between increases in discharge efficiency from the biofilter since if this rises it will start to exhaust the carbon filter defining the red action. Contextual knowledge must inform any triggers for action; rather than focusing on a single value.

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

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:

- Visibility using local SCADA control panels for OCU , which records fan status
- 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 6 in the OMP. There is connectivity between the site rounds and SCADA, for example, if excessive noise is recorded this could relate to an operational fault in OCU, and in turn, is visualised on the local SCADA screens.

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 the biofilter,* so this parameter has less relevance. Biofilter post humidification should achieve a level of >90%. Carbon units should be set at <70%.

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).

The Odour Control Unit outlet hydrogen sulphide monitor is serviced quarterly under a separate contract.

Note a: Lava media within the biofilter has an expected bed life of over 15 years.

Note b: Current Sensing Relays are fitted to monitor the motor current and provide an alarm should the **fan belt or motor** fails:

- If the duty Odour Control Fan trips fail, an alarm is raised on SCADA and the standby fan will operate in place of the tripped fan.
- If both Odour Control Fans trips fail, an alarm is raised on SCADA. The duty Odour Control Fan changes every 24 hours.

Note c: The timer system for the wash water should ensure that the filter media is kept wetted and that the pH of the drainage water is within limits (normally between 4.5 and 6.5). The media should not be allowed to dry out; if this occurs, unequal treatment and odour bleed-through can occur. The dried out areas should be thoroughly wetted in an attempt to recover. If this fails then the media should be replaced.

Note d: If there are large amounts of media in the drainage water the media should be inspected carefully along with its supports.

Note e: Not less than 90% wetting surface should be aimed for.

Note f: Weed growth is limited in the covered unit but must be managed as foul gas may track around root balls or cracks in the media.

5.1.4 Records

Maintenance history records are kept electronically on SAP or the company's SharePoint system.

Contractor service reports are held by the Team Manager.

5.2 Fault Reporting

Faults identified during routine inspections are reported to the Process Controller 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

Emergency repairs out of normal working hours are covered by stand-by arrangement for both maintenance and operational staff. Within normal working hours, the Process Controller will raise work at the appropriate criticality.

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 Beddington STW will be made via the Customer Services Centre, logged, and passed (directly, or via the WOCC) to local Operations (Process Manager and Team Manager) via e-mail. Operations will investigate and take appropriate action. Complaints may also be received from the local council and Environment Agency.

Customers / residents are encouraged to communicate with local Thames Water Operations via the Customer Services Centre to report if they are noticing odour from Beddington STW, to ensure that all contacts are recorded and actioned. Customers have 3 main options to report complaints to Thames Water:

1. Thames Water Website – "Report A Problem" at https://www.thameswater.co.uk/contact-us/report-a-problem/report-a-problem-online.

2. Email - customer.feedback@thameswater.co.uk with the subject 'Beddington Sewage Treatment Works'

3. Telephone - Customer Services 0800 316 9800

If the customer / resident would prefer to contact the Environmental Services of London Borough of Sutton, their contact details are as follows:

Environment Agency – 0800 80 70 60

London Borough of Sutton – Environmental Services
Telephone: 0208 770 5000

Customer contacts regarding Beddington 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 (CSM) of the contact details in order that they can ensure the complaint is captured and recorded by the Customer Services Centre.

Complaints received via Customer Services Centre:

- Complaint information is logged electronically by the Customer Services Centre.
- An action is raised to Waste Operations Control Centre (WOCC) who contact the CSM by telephone and email the complaint information to both the CSM and Performance Manager
- The Performance Manager and CSM will review the complaint and take action to investigate (see section 6.3)
- The CSM is responsible for contacting the customer and updating them on the outcome of the investigation.
- Any problems are noted and remedial work actioned. An update of action taken and feedback given to the customer is emailed to the WOCC by the CSM.
- The WOCC update the electronic complaint report and it is closed down.

Complaints received via email or post:

- Complaint information is logged electronically by Customer Relations and allocated a Case Manager.
- The complaint is emailed to the CSM who reviews the complaint and investigates with the Performance Manager (see section 6.3).
- Actions taken are emailed back to the Case Manager who updates the electronic system and updates the Customer.

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 Beddington 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.

Should the source of the odour be confirmed as coming from the Thames Water Operations then the Performance Manager will review all activities currently taking place on site, including any maintenance, cleaning, and non-standard activities to identify the root cause, and ensure appropriate mitigation measures are in place.

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.

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 4.2 and 4.3 are in place. It may also include off-site visits to the Customer location.

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.

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 who will log the details on their Bulletin Board. This will be used to provide information directly to customers who call with queries. Letter drops may also be used.

The Customer Stakeholder Manager 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.

For assets under STC permit, we notify the EA in accordance with the permit conditions and notifications procedure, see appendix 3.

If notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, Thames Water shall investigate and carry out a review of the OMP and appropriate measures if deemed necessary.

Appendices

Appendix 1. Odour Risk Assessment

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Appendix 2. Odour Improvement Plan

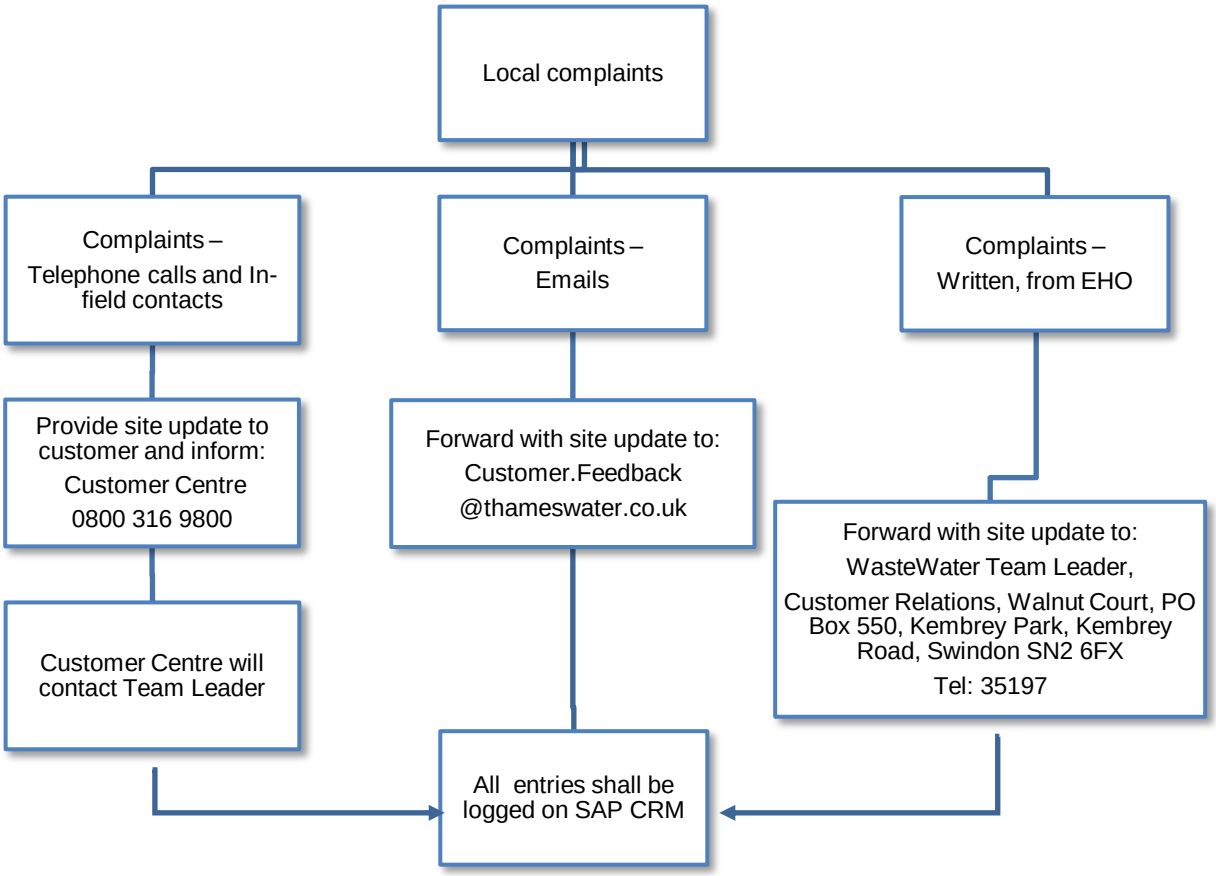
Odour Improvement Plan Beddington STW

Review Date		Nov-23				
Process Stage	**Owner**	**Plan**	**Action**	**Expected difficulties**	**Measures to mitigate**	**Timeframe**
Storm tanks	Adrian Wallis/ Richard Merry		To install a flushing system	Funding	Manual clean when required	AMP 8
New Sludge Import Facility	Adrian Wallis		Indirectly improve odour by importing directly into sludge stream instead of largely uncovered head of works	None	None	Apr-24
OCU	Adrian Wallis	Action recommendations laid out by monthly health checks	Action recommendations laid out by monthly health checks	Achieving funding	OCU monthly health checks, site rounds	ongoing
Sniff Testing	Odour Specialist	Implement sniff testing procedure	Procedure written for sniff testing, in order to achieve effective sniff testing personnel needs to be identified to carry out the procedure who are not acclimatised to smells on site.	Resource	OCU monthly health checks, site rounds	6 months from STC permit issue

Appendix 3. Customer Communications Plan

Complaints Process

All locally received complaints are re-directed to the Customer Centre. Please see 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 Telephone: 07747 647 304

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 and 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 and Customer & Stakeholder Manager
Environment Agency	As required	Telephone / email / meeting	Update on operational activity on site	Performance Manager and 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 and Customer & Stakeholder Manager
Local residents associations *(if applicable)*	Immediately then monthly	Telephone / email / meeting	Report unstable operation with action plan	Performance Manager and 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 Beddington 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 and 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 Manager (Operations Manager) / Level 4 Manager (Regional Operations Manager)
Local residents associations (if applicable)	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Performance Manager and 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 Manager (Operations Manager) / Level 4 Manager (Regional Operations Manager)
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	Duty Manager

			from customers (reactive only)	
Other areas/stakeholders outside Beddington 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	Process / Site Manager

Appendix 4. Site Drawings

Figure A - Site location map

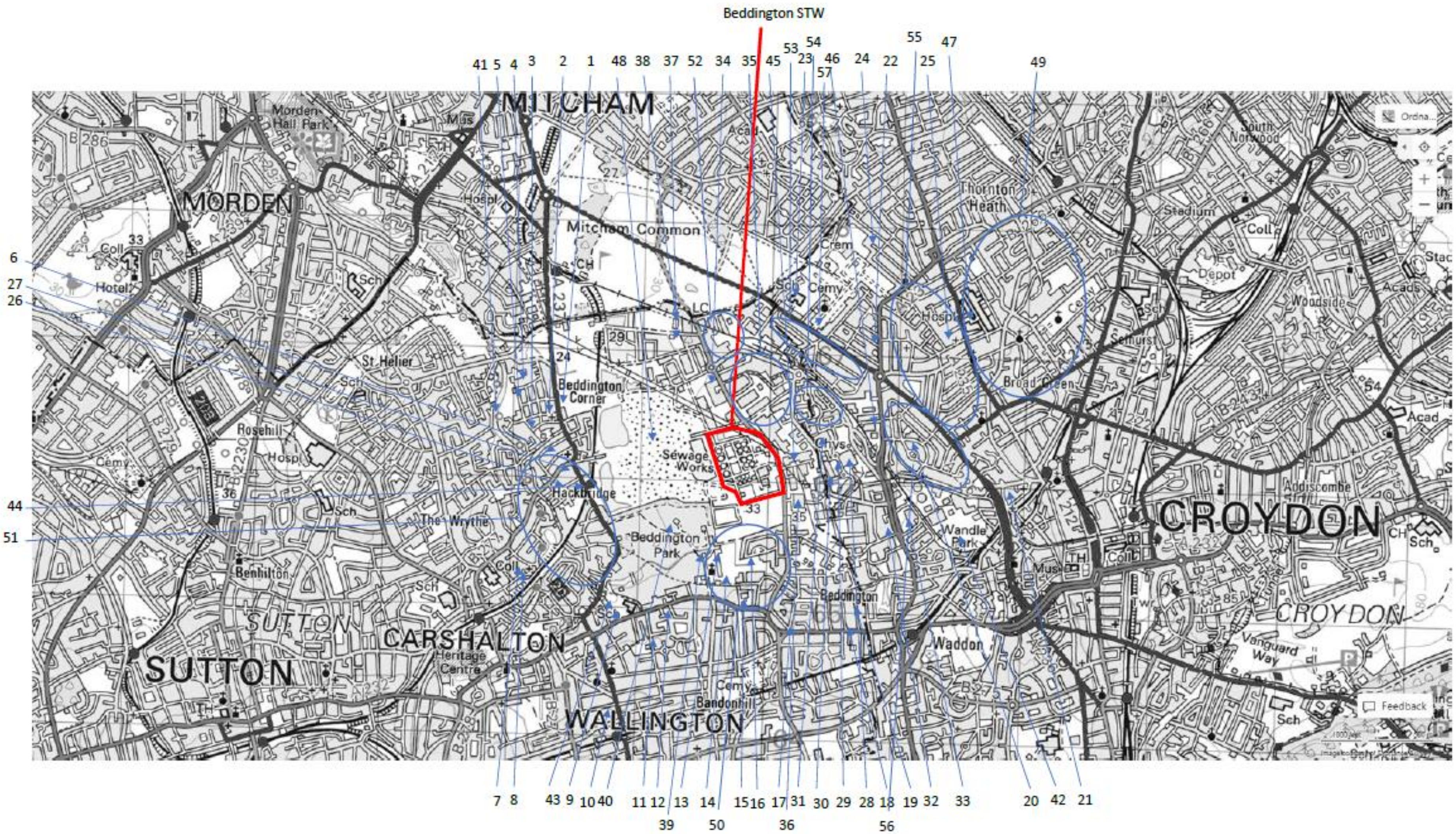

Beddington STW
MITCHAM
MORDEN
SUTTON
CARSHALTON
WALLINGTON
CROYDON
Sewage Works
Beddington Park
Hackbridge
Mitcham Common
Thornton Heath
Waddon
Beddington Corner
Rosehill
St.Helier
The Wrythe
Wandle Park
Addiscombe
Woodside
Broad Green
Bandonhill
Benhilton

Figure B - Site Plan

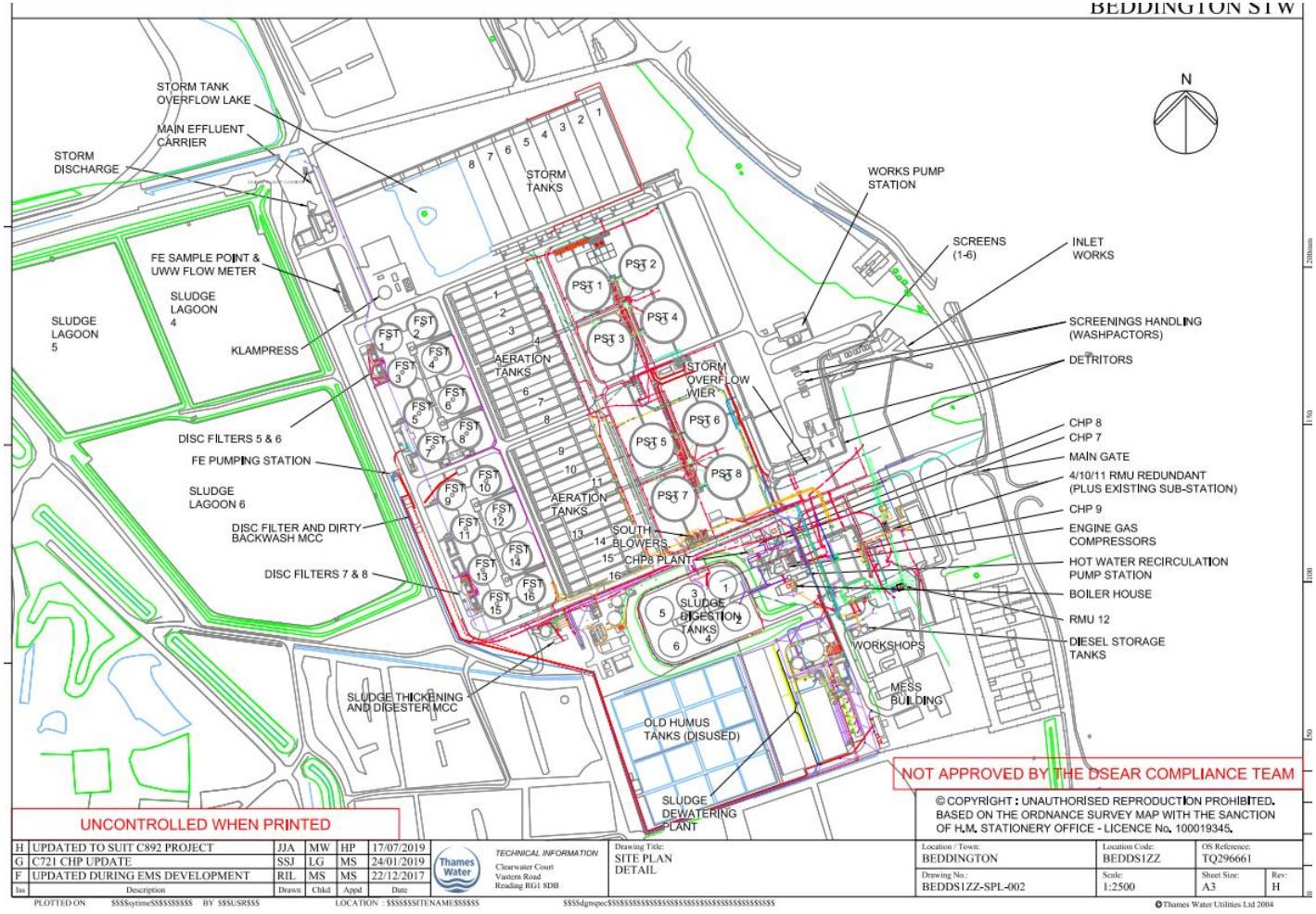


Figure C - Area Permitted under Sludge Treatment Centre Permit

Figure D - Process Block Diagram showing process routes, raw material inputs and waste outputs

Appendix 5. Service delivery plan for removal of sludge cake from Beddington Sewage Treatment Works

SERVICE DELIVERY PLAN FOR REMOVAL OF SLUDGE CAKE FROM BEDDINGTON SEWAGE TREATMENT WORKS

Preamble

Digested liquid sludge is produced at Beddington Sewage Treatment Works (STW) from the sewage treatment processes. This liquid sludge is to be dewatered to a semi-solid "cake" by the new dewatering plant and will be exported from the STW to agricultural outlets, generally to the south of London in Surrey, Sussex and Kent. The production of this material is carried out 24hrs/day, 365 days/year and the sludge barns which are the subject of this planning permission can provide storage for up to 30 days' worth of STW production of the cake under circumstances where transport to agriculture is not practicable. This is most likely to be required under very wet or icy/snowy conditions when vehicles cannot access either the Beddington STW site, or more likely, the farm fields.

Under normal circumstances, sludge cake will be removed up to 5 days/week and thus the typical quantity of sludge cake stored on site should be no more than a few days production. In some cases, access to a farm will be for a specific window of time, requiring a high intensity of deliveries. To allow this, a quantity of sludge cake may be deliberately built up in site storage and removed by increased vehicle movements over a few days.

The principal activity at the sludge dewatering plant and sludge barns (the plant) will therefore be the loading and removal of sludge cake from site. The only deliveries to the site will be for chemicals (polyelectrolytes) to assist with the dewatering process and these will be at infrequent intervals up to 2 vehicles per month.

Loading and Unloading Areas

The plant is located well within the boundary of Beddington STW, as shown in Plan 1. The detailed layout of the plant is shown in Plan 2.

Sludge cake will be loaded onto HGVs in the area between or adjacent to the two sludge barns (points 4 and 22 on Plan 2). Polyelectrolyte will be unloaded into the polymer silo at point 10 on Plan 2. These points are well inside the works and loading/unloading will have no impact whatsoever on the highway.

Haulage Contractor Service

Viridor Waste (Thames) Ltd (Viridor) will be carrying out the management and operation of the haulage of dewatered sludge to remediation or agriculture. Viridor will utilise either its own or sub-contract vehicles for the haulage, but the loading and control of the routeing to agriculture will be by Viridor.

Management Systems

The haulage and sludge cake utilisation contract will be managed by Viridor's Recycling Manager, who has extensive experience in the haulage and application of biosolids to agriculture. Records will be kept at the plant of the daily number of collection vehicles, tonnages loaded, registration numbers and destination of each load. Sludge cake will be sampled once daily to provide contract information on dry solid content and these samples will be bulked on a monthly basis to provide information on heavy metal and nutrient concentrations. This information will be logged centrally with the Bio-Recycling team buildings at Beddington STW to ensure that the application rates to the farmland are known for each of the required parameters. Soil from the application sites will also be analysed and the data recorded to comply with the Sludge (Use in Agriculture) Regulations.

Regular consultation will be carried out between Viridor and the Thames Water Bio-Recycling team to ensure sludge removals from site are optimised Monthly contract meetings will be held between Viridor and Thames Water to communicate information on tonnage transported, costs and any operational matters requiring attention.

Frequency of Vehicle Collections

It is calculated that the annual sludge cake production at Beddington will be approximately 27,500 tonnes. If it was possible to remove this material without restriction, this would require 5-6 vehicles per day 5 days per week on average. The effects of wet or icy weather, frozen ground, or non-availability of land owing to agricultural cycles means that it is more realistic to work on a basis of 5 days per week, 10 months per year, or 200 days per year. This would require 7 vehicles per day on average.

However, sludge cake will accumulate in the barns when land cannot be accessed and this must be cleared subsequently. Taking the maximum capacity of the barns (30 days STW production) and allowing for the transport of the continuing production after a full-storage event, clearing the backlog over 30 days, this would double the average vehicle frequency to 14 per day.

Frequencies of Deliveries

Polyelectrolyte will be delivered to the STW approximately up to twice a month in a single vehicle.

Timing of Collections and Deliveries

Under typical operating conditions (7 vehicles per day), the collections can be arranged to avoid peak travel hours on Beddington Lane and the surrounding highway network. Under these circumstances, vehicles would aim to arrive and depart from the site between 10am and 3pm. Following periods of adverse weather and accumulation of stored material, the higher rate of vehicle collections would be needed and arrivals and departures could be from approximately 8am to 4pm. Depending on the location of the agricultural outlet, it will be in Viridor's interest to avoid peak travel times when possible to minimise delays.

Type of Product being Removed

The product is a semi-solid stabilised non-hazardous organic material used as soil conditioner and fertiliser in agriculture. It will be transported in sheeted HGVs which will be sealed to prevent loss of material from the vehicle in transit.

Quantity being Removed each Collection

The trucks will be loaded with 20 tonnes of material on each load. The trucks will be fitted with load cells so that the weight of material loaded can be determined at the loading point and it can be ensured that the maximum permitted load is carried.

Urgency of Material being Moved

Thames Water has little control over the quantity of sludge produced as it is the consequence of sewage arriving at the STW 24 hrs a day, 365 days per year. There is therefore no opportunity to switch-off production. It is therefore of the utmost urgency to ensure that sludge cake is removed on a regular basis. Storage capacity for 30 days' worth of STW sludge cake production is available. If this capacity is filled material must be removed from site. However, experience in the region has found that 30 days storage capacity is almost always sufficient to cope with extreme weather conditions or unavailability of agricultural outlets.

On-Street Loading/Unloading

There will be no circumstances under which on-street loading or unloading will be required.

Routing of Vehicles

As a wide range of locations of agricultural outlets will be utilised, it is not possible to define vehicle routes exactly. However, as a general rule, HGVs will be directed to access the A23 via Beddington Lane, Coomber Way and Ampere Way, then following the A23 to the M25 junction 7. From there, the routes will vary according to the outlets in use at the time. See map (Plan 3).

Mode of Transport and Vehicle

The vehicles used for sludge cake removal will be 20 tonne, 8 wheel, tipper trucks.

Who is the Delivery for?

Deliveries will be for utilisation of dewatered sludge as a fertilser for use in agriculture at a number of farms across the south of England. A**Factors Dictating Frequency of Collections**

As outlined above, the frequency of collections can be infrequently affected by unusually adverse transport conditions (floods, icy roads, heavy snowfall) or by non-availability of agricultural outlets. The latter may be due to frozen or flooded land, or periods in the agricultural cycle when sludge cannot be applied to land (during planting or growth of the crop). Sludge is usually applied after harvest and before the next planting. Owing to the diversity of crops and crop cycles across the region, there are few times in the year when no land is available.

SITE ASSESSMENT

Entrance to Premises

Collection and delivery vehicles will access the Beddington STW site via the main sewage works entrance on Beddington Lane. This is a gated entry, with the gate sufficiently set into the bell-mouth so that no obstruction of the highway occurs whilst the gate is being opened. Once inside the site, there is approximately 300m of site roadway to traverse before arriving at the plant (see route shown on Plan 1). Vehicle access and departure from the plant itself are both in a forward direction.

Loading or unloading of vehicles is only possible at the plant itself and will not be carried out anywhere else.

MANAGING DELIVERIES AND COLLECTION

Routes and Roads to be Used

As discussed above, owing to the diversity of agricultural outlets, which are procured on a time-by-time basis, the routes cannot be specified until closer to the time of collections. However, the main route away from the Beddington STW site can be specified and is shown on Plan 3.

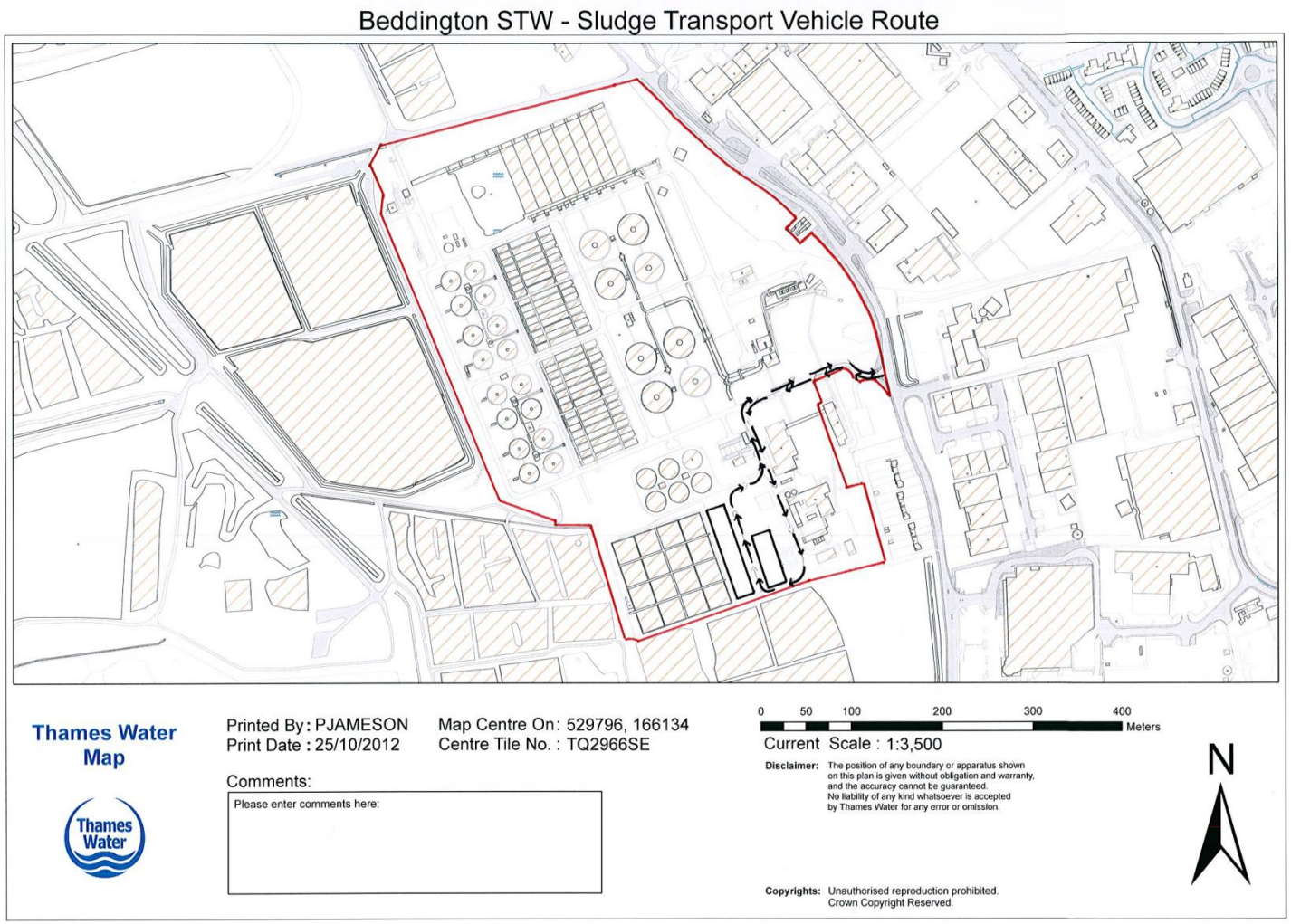
Scope to Reduce Collections or Deliveries

Owing to the continuous production of sludge cake at the site, there is no scope to reduce the overall tonnage removed from the site. Efforts will be made to smooth the daily number of collections wherever possible to try to achieve as close to the average vehicle flow as possible but will be subject to the weather and agricultural conditions described above.

Collection Strategy to Reduce Congestion on Roads

Where possible and during periods when the number of daily collections is close to the average, vehicles will be scheduled to arrive at the site outside peak travel times, for example between 10am and 3pm. At times when peak collections are required, for example after a period of reduced or zero collections due to external factors, the vehicles will need to be arriving at the site over an extended period of time which may include some peak travel times. This will be avoided whenever possible.

Plan 1 – Location of plant and access route within Beddington STW



Plan 2 – Layout of Dewatering Plant and Storage Barns

LEGEND:

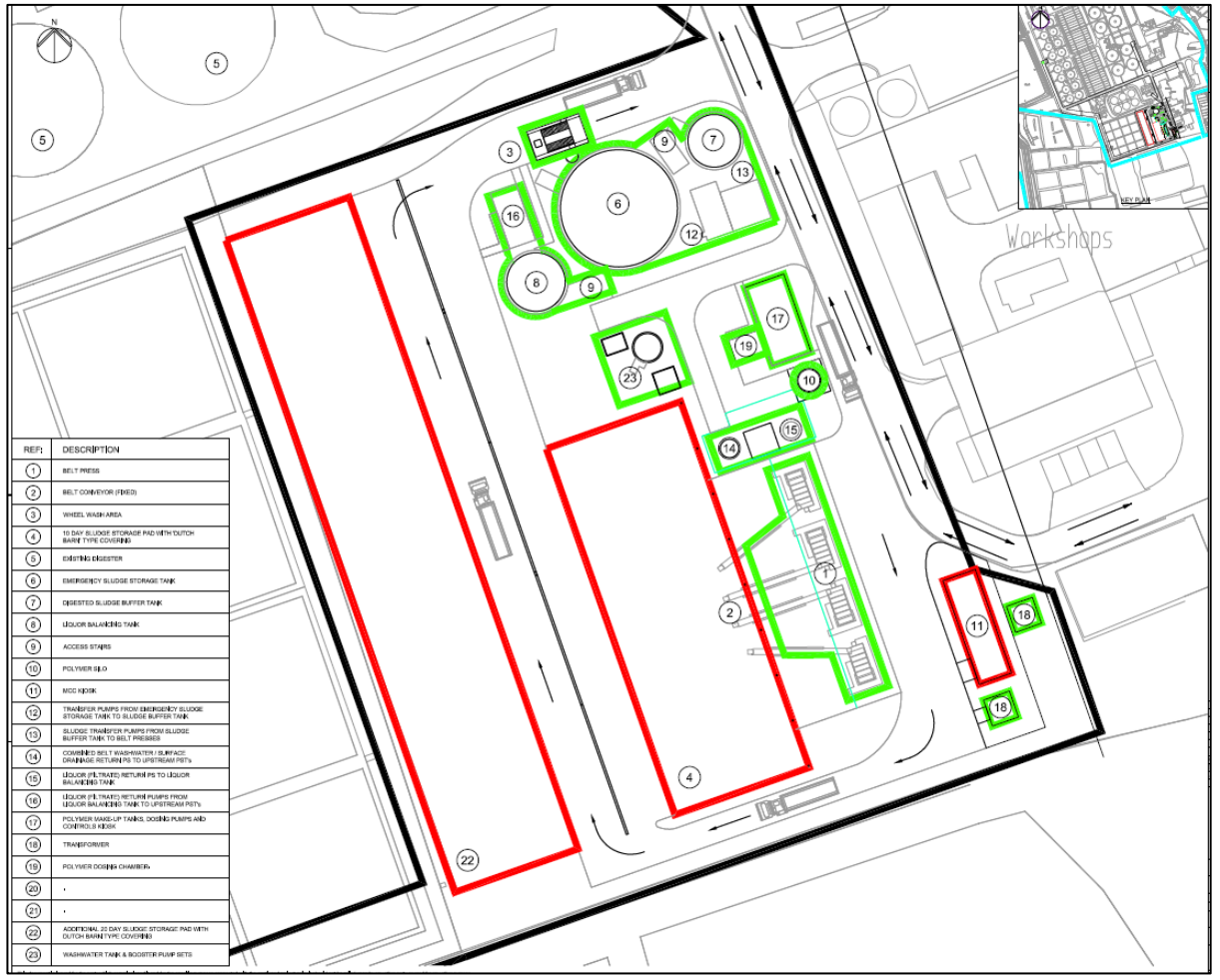
EXTENT OF THAMES WATER OWNERSHIP

DEVELOPMENT WORKS BOUNDARY

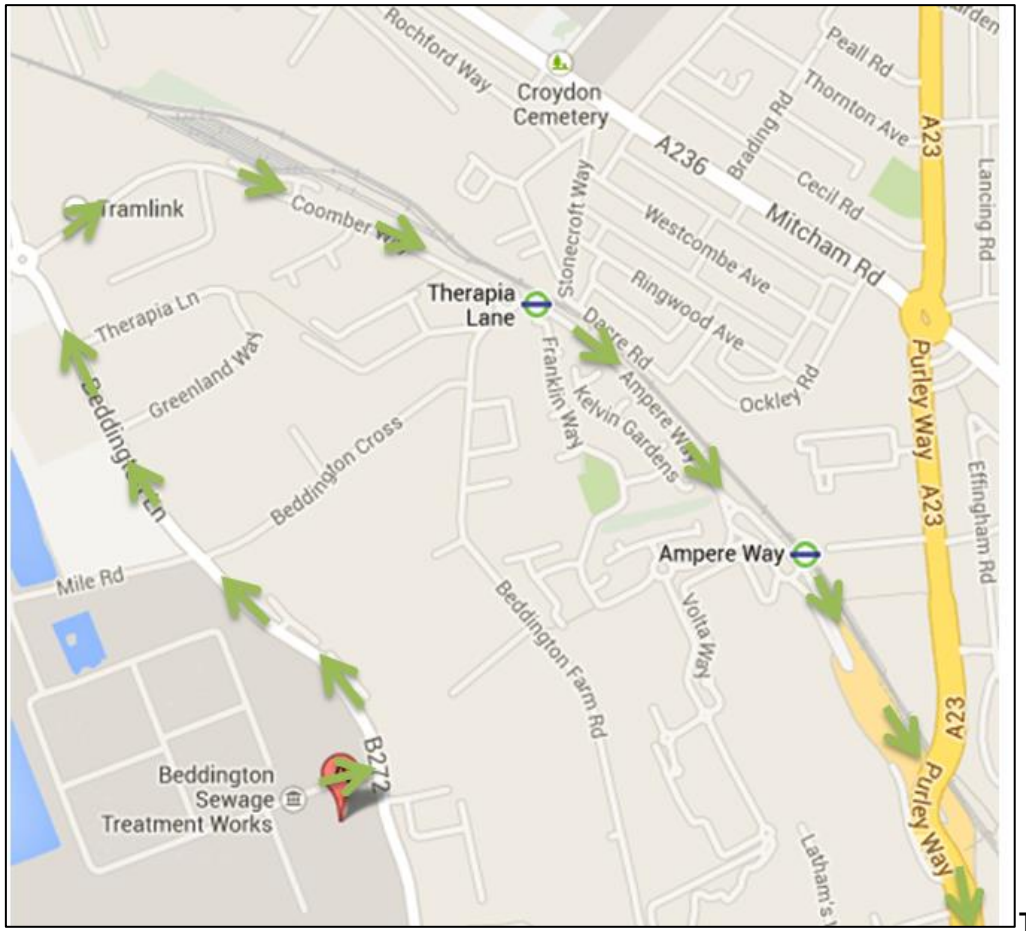
PLANNING APPLICATION BOUNDARY

PERMITTED DEVELOPMENT COMPONENTS

DIRECTION OF VEHICLE FORWARD MOVEMENTS



Plan 3 – Route of Delivery Vehicles using Local Roads



To the M25

Appendix 6. Site Rounds

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**	
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**	

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
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**	
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. Clean the brushes as required. Ensure the brushes are in correct contact with the screen and that screenings are being removed.	**X**	
l)	Check and clean instrumentation probes, floats and ultrasonic heads (where applicable).	**X**	
2.4	**Screenings handling**	Daily	Weekly

ID	Instruction	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**
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**	

ID	Instruction	Daily	Weekly
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
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

ID	Instruction	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**	
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**	
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**	

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
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
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	

ID	Instruction	Daily	Weekly
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
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**	
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

ID	Instruction	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**	
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**	

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
c)	Check damper position to ensure they have not been tampered with	X	
d)	Check ductwork for any signs of damage or leaks	X	
	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
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	

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
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 7. Sludge Rounds

	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?	**X**	

	Instruction	Daily	Weekly
	If it is low and chattering it could indicate the pump is blocked.		
5	**Pasteurisation**	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**	

	Instruction	Daily	Weekly
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. Analyse and record % dry solids. (Monday, Wednesday, Friday.) Analyse and record % volatile matter. (3 times a week Monday – Thursday)	**X**	
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**	

	Instruction	Daily	Weekly
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	
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	

	Instruction	Daily	Weekly
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
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**

	Instruction	Daily	Weekly
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**	
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**

	Instruction	Daily	Weekly
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**	
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**	

Appendix 8 – Monthly Health Checks

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.	

Appendix 9 Odour sniff testing protocol

Purpose

Sniff testing is conducted to assist in managing odours to prevent or minimise the risk of adverse odour impact offsite.

Frequency

The procedure is to be undertaken in response to complaints or if a risk of odour nuisance at sensitive receptors is expected and/or has been substantiated.

Pre-requisites for the assessor

The assessment is undertaken by a member of staff trained in the procedure. The assessment in response to complaints will be carried out by someone not based on site. The member of staff will normally be office based rather than operations based. This means that their senses are less likely to become affected by any site odours.

Assessors must comply with the following:

- They should not consume strongly flavoured food or drink (this includes coffee) at least half an hour before conducting the assessment.
- They should not smoke at least half an hour before conducting the assessment.
- They should not consume confectionary or soft drinks must be avoided for the duration of the assessment.
- Scented toiletries including perfume, deodorant or aftershave should not be applied less than an hour before conducting the assessment.
- If the assessment requires travelling between locations in a vehicle, this vehicle must not contain deodorises / air fresheners.
- If the assessor has a cold, sore throat, or sinus trouble they should not conduct the assessment.

Prior to the commencement of the inspection, the operator shall check the weather data including the wind direction, wind speed, temperature and rainfall.

Odour complaint investigation

Where possible, odour complaints will be actively investigated by an assessor. Timely receipt of a complaint is essential if such investigations are to have any value.

At each location the following procedure is undertaken:

a. The assessor will stand facing the wind and breathe deeply, for a period of 3-5 minutes.

b. The following information is recorded using the odour monitoring form.

   i. Time, wind speed and direction, temperature, precipitation.

   ii. The type of any odour(s) detected.

   iii. The intensity of any odours detected on a scale of 0 to 6.

   iv. The persistence of the any odours detected i.e. constant or intermittent.

   v. The likely source of any odours detected (e.g. a specified onsite IED source, a specified non IED sources, offsite odour source, etc).

   vi. Any abnormal conditions on site that may account for the odour e.g. broken duct, open door, unusual operation, spillage etc.

The pre-requisites for assessors and monitoring approach are as defined in the sniff testing procedure with the following exceptions:

- The first assessment should be conducted at the complainant's location.
- If site odours are detected, the assessor shall move back towards the site, assessing potential odour sources within the Urban Waste Water Treatment (UWWT) and Sludge Treatment Centre (STC) processes and attempt to trace the odour to its source.
- On site operations shall also be reviewed to identify any abnormal site operations or activities that could be responsible for elevated odour levels.
- The sensitivity of the offsite location to odours should be recorded as a comment.

The findings of the investigation should be reported back to the Thames Customer Services Centre so that feed-back can be provided to the complainant.

Odour monitoring form

Date: _____ Assessor name: _____

Time	Location	Receptor sensitivity (off site locations only)	Wind speed & direction	Temperature (degrees)	Rainfall (y/n)	Odours detected (description)	Intensity (0 – 6)	Persistence (intermittent / constant)	Perceived source	Other comments

Intensity			**Receptor Sensitivity**
1 Very faint odour	3 Distinct odour	5 Very strong odour	Low (e.g. footpath, road)
2 Faint odour	4 Strong odour	6 Extremely strong odour	Medium (e.g. industrial or commercial workplace)
			High (e.g. housing, pub/hotel etc.)

---- End of OMP ---