

Application No. :
Reference No. :
(For official use)

FORM 5
ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE
(CHAPTER 499)
SECTION 13(1)

Application for Variation of an Environmental Permit

PART A PREVIOUS APPLICATIONS

No previous application for variation of an environmental permit.
 The environmental permit was previously amended.
Application No. : VEP-491/2016

PART B DETAILS OF APPLICANT

B1. Name : (person or company)
Environmental Protection Department - Waste Infrastructure Planning Division
[Note : In accordance with section 13(1) of the Ordinance, the person holding an environmental permit or a person who assumes responsibility for the designated project may apply for variation of the environmental permit.]
B2. Business Registration No. : [REDACTED]
(if applicable)
B3. Correspondence Address : [REDACTED]
B4. Name of Contact Person : [REDACTED]
B5. Position of Contact Person : [REDACTED]
B6. Telephone No. : [REDACTED]
B7. Fax No. : [REDACTED]
B8. E-mail Address : (if any) [REDACTED]

PART C DETAILS OF CURRENT ENVIRONMENTAL PERMIT

C1. Name of the Current Environmental Permit Holder :
Director of Environmental Protection
C2. Application No. of the Current Environmental Permit : VEP-491/2016
C3. The Current Environmental Permit was Issued in : month / year
02 / 2016

Important Notes : Please submit the application together with
(a) 3 copies of this completed form; and
(b) appropriate fee as stipulated in the Environmental Impact Assessment (Fees) Regulation
to the Environmental Protection Department at the following address :
The EIA Ordinance Register Office,
27th floor, Southorn Centre, 130 Hennessy Road,
Wan Chai, Hong Kong.

Tick (✓) the appropriate box



PART D PROPOSED VARIATIONS TO THE CONDITIONS IN CURRENT ENVIRONMENTAL PERMIT

D1. Condition(s) in the Current Environmental Permit :	D2. Proposed Variation(s) :	D3. Reason for Variation(s) :	D4. Describe the environmental changes arising from the proposed variation(s) :	D5. Describe how the environment and the community might be affected by the proposed variation(s) :	D6. Describe how and to what extent the environmental performance requirements set out in the EIA report previously approved or project profile previously submitted for this project may be affected :	D7. Describe any additional measures proposed to eliminate, reduce or control any adverse environmental impact arising from the proposed variation(s) and to meet the requirements in the Technical Memorandum on Environmental Impact Assessment Process :
<p>Part B. Scale and Scope of Designated Project The Project is to: (i) construct and operate the Sludge Treatment Facilities, which are designed to treat 2,000 wet tonnes/day of the dewatered sludge to be generated after the sewage treatment process in the Stonecutters Island Sewage Treatment Works and 10 other regional sewage treatment works;</p> <p>Part C. Clause 2.10 The Project shall treat a maximum of 2,000 wet tonnes/day of dewatered sludge to be generated in regional sewage treatment works.</p>	<p>Part B. Scale and Scope of Designated Project The Project is to: (i) construct and operate the Sludge Treatment Facilities, which are designed to treat 2,000 wet tonnes/day of the dewatered sludge to be generated after the sewage treatment process in the Stonecutters Island Sewage Treatment Works and 10 other regional sewage treatment works;</p> <p>Part C. Clause 2.10 The Project shall treat a maximum of 2,000 wet tonnes/day of dewatered sludge to be generated in regional sewage treatment works, or sludge from other sources including dewatered grease trap waste sludge or sewage sludge from other sewage treatment works subject to proposals to demonstrate conforming with the environmental performance requirements of the Project as set out in the approved EIA Report (Register No.: AEIAR-129/2009) for approval by the Director.</p>	<p>To conduct a trial burn of grease trap waste (GTW) sludge at STF, in addition to those from the Stonecutters Island Sewage Treatment Works and 10 other regional sewage treatment works.</p>	<p>As detailed in the ERR, the following are concluded: - the GTW sludge would be in similar nature, but less noxious and less contaminated than sewage sludge; - the tonnage of GTW sludge to be treated is only about 1% of the dewatered sewage sludge being treated; and - there is no material environmental change arising from the proposed variation.</p>	<p>In view of the similar nature / composition with dewatered sewage sludge and small treatment amount, as well as the total quantity of sludge to be treated would not exceed 2,000 wet tonnes / day, there is negligible impact on the environment and community by the proposed variation.</p>	<p>The environmental performance requirement set out in the EIA report previously approved (Register No. AEIAR-129/2009) are not exceeded nor violated.</p> <p>The project still complies with the requirements described in the EIAO-TM. For details, please refer to the ERR.</p>	<p>A contingency plan is provided in the enclosed ERR. Odour patrols will be conducted to monitor the odour impact.</p> <p>Water-tight container trucks will be deployed for transportation of the GTW sludge.</p> <p>And a trial burn report will be submitted afterwards.</p> <p>For details, please refer to the ERR.</p>

PART E DECLARATION BY APPLICANT

E1. I hereby certify that the particulars given above are correct and true to the best of my knowledge and belief. I understand the environmental permit may be suspended, varied or cancelled if any information given above is false, misleading, wrong or incomplete.

  
Signature of Applicant Full Name in Block Letters Position

on behalf of Environmental Protection Department
- Waste Infrastructure Planning Division 27 Oct 2021
Company Name and Chop (as appropriate) Date

NOTES :

1. A person who constructs or operates a designated project in Part I of Schedule 2 of the Ordinance or decommissions a designated project listed in Part II of Schedule 2 of the Ordinance without an environmental permit or contrary to the permit conditions commits an offence under the Ordinance and is liable to a maximum fine of \$5,000,000 and to a maximum imprisonment for 2 years.
2. A person for whom a designated project is constructed, operated or decommissioned and who permits the carrying out of the designated project in contravention of the Ordinance commits an offence and is liable to a maximum fine of \$5,000,000 and to a maximum imprisonment for 2 years.

Environmental Review Report
Trial Burn of Grease Trap Waste Sludge
in Sludge Treatment Facilities

Background

1. Currently, the grease trap waste (GTW) received at the GTW Treatment Facility at West Kowloon Transfer Station is screened, sand-filtered and processed by dissolved air flotation units for oil-waste separation. The separated oil and grease is stored in containers and delivered to the waste cooking oil recycling plant in EcoPark for further recovery of the remaining oil content by filter presses. At present, the GTW sludge coming out from the filter presses is then disposed of at the West New Territories (WENT) Landfill.

2. The GTW is collected from the grease traps, which are installed before the wastewater to be discharged to foul sewer from restaurants, canteens and food processing factories. By considering the nature and source of the GTW sludge, one can appreciate its origin is similar to sludge generated from sewage treatment works (STWs), but significantly less noxious and less contaminated given that its origin from the restaurant kitchens and prior-treated by dissolved air flotation units. Below tabulating properties and chemical composition of sludges reflects that GTW sludge contains about 60% and 85% less of sulfur and chlorine respectively comparing to that of sewage sludge from primary STWs (details at [Appendix A](#)). Sulfur and chlorine from sludge would contribute as hydrogen sulphide, hydrogen chloride, and dioxins respectively during delivery / storage and treatment.

Sludge	GHV	VS	C	H	O	N	S	Cl	Ash
	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	MJ/kg	%	%	%	%	%	%	%	%
Primary STWs	6.28	71.99	45.41	6.40	26.35	2.78	1.76	1.19	17.01
Secondary STWs	3.84	58.80	33.22	4.68	18.58	5.62	2.80	1.36	34.71
GTW	11.02	93.00	57.41	7.76	23.43	3.45	0.68 ^a	0.16 ^b	7.27

Notes:

^a S: About 60% less [= -61% = (0.68 – 1.76) ÷ 1.76 x 100%]

^b Cl: About 85% less [= -86% = (0.16 – 1.19) ÷ 1.19 x 100%]

Proposed Trial Burn

3. SFG of EPD has been exploring to treat the GTW sludge (actually to be mixed

with dewatered sewage sludge) at the Sludge Treatment Facilities (STF) with a beneficial view to reducing the burden to the WENT Landfill. In addition, the proposal would not cause any physical change to STF.

4. The STF Contractor has completed a preliminary technical feasibility desktop study, indicating that co-treatment of the GTW sludge is not expected to negatively impact to the flue gas emissions other than the increase of dosing of flue gas treatment chemicals, of which mainly include lime, sodium bicarbonate, and activated carbon. These chemicals will be either reacted with pollutants in the flue gas and/or separated from the flue gas and collected as ash and residue. The injection dose will be properly controlled. Quantity of these by-products is expected within the amount estimated in the EIA Report.

5. To further assess the actual technical and environmental impacts arising from the co-treatment of the GTW sludge, the STF Contractor has prepared a 6-week trial burn plan (key information at [Appendix B](#)) proposing to co-treat the GTW sludge in one of the four trains with tonnage gradually ramping up from 3 tonnes per day (tpd) to 15tpd, which is not significant compared to 500tpd capacity for each train and 2,000tpd capacity for the whole plant, as illustrated below minimal contributions.

	Contribution		
Trial Burn of 15tpd (maximum) GTW sludge would only contribute	0.75%	of	2,000tpd design treatment capacity.
	1.45%	of	1,034tpd (on average) sewage sludge treated in 2020.

6. In order not to jeopardise treatment of dewatered sewage sludge, only 1 train in only 1 plant (A or B) will be dedicated to the trial burn. Tentatively, the co-treatment ratio of primary sewage sludge / (secondary sewage sludge + GTW sludge) would be maintained at about 80 / 20 on average to reflect normal operating conditions. The ratio would be adjusted as necessary to minimise fluctuations of combustion parameters.

7. During the trial burn period, the treatment system will be closely monitored, to ensure compliance and stable operation, in particular treatment process at 850°C for at least 2 seconds residence time for complete combustion, as well as temperature and pollutant concentrations at flue gas emission (by both Continuous Emission Monitoring System (CEMS) and regular stack gas sampling).

8. Data will be collected (both operational and emission data) and analysed accordingly in order to evaluate technical feasibility and any impact of treatment of GTW sludge with dewatered sewage sludge at STF in representative and systematic manner.

9. The existing control logic of automatic cut-off systems will prevent or cut-off sludge feeding immediately into the treatment system if there is a risk of abnormal operation and emission, including treatment temperature of 850°C not maintained.

10. In addition, if the trial indicates that co-treatment of GTW sludge has potential risk of undesirable negative impacts on the operation (whether on safety, sludge conveying system, odour, combustion, or any other topics), the trial may have to be interrupted. In such case, the GTW sludge delivery from the waste cooking oil recycling plant to STF will be discontinued and, if required, the remaining volumes of GTW sludge would be removed from the bunker and sent to the WENT Landfill.

Proposed Variation of Environmental Permit

11. SFG of EPD and the STF Contractor are the Environmental Permit (EP) holders of the STF (reference no. EP-334/2009/E and FEP-01/334/2009/E). Scale and Scope of Designated Project of Part B, and Condition 2.10 of Part C of the EP are proposed to vary:

Scale and Scope of Designated Project of Part B

from "The Project is to: (i) construct and operate the Sludge Treatment Facilities, which are designed to treat 2,000 wet tonnes/day of the dewatered sludge to be generated after the sewage treatment process in the Stonecutters Island Sewage Treatment Works and 10 other regional sewage treatment works;"

to "The Project is to: (i) construct and operate the Sludge Treatment Facilities, which are designed to treat 2,000 wet tonnes/day of the dewatered sludge to be generated after the sewage treatment process in the Stonecutters Island Sewage Treatment Works and 10 other regional sewage treatment works;"

Condition 2.10 of Part C

from “The Project shall treat a maximum of 2,000 wet tonnes/day of dewatered sludge to be generated in regional sewage treatment works”

to “The Project shall treat a maximum of 2,000 wet tonnes/day of dewatered sludge to be generated in regional sewage treatment works, or sludge from other sources including dewatered grease trap waste sludge or sewage sludge from other sewage treatment works subject to proposals to demonstrate conforming with the environmental performance requirements of the Project as set out in the approved EIA Report (Register No.: AEIAR-129/2009) for approval by the Director.”

Reason for the Proposal

12. The proposal aims to allow the trial burn of the GTW sludge. The data will be collected and analysed accordingly in order to evaluate technical feasibility of co-treatment of GTW sludge with dewatered sewage sludge at STF. This could bring beneficial and synergic effect to reduce burden to the valuable landfill void space, or enhance stability.

13. Prior to reviewing and assessing potential environmental implications by the proposed trial burn in details, it is essential to highlight again and summarise features of the trial burn as follows:

Features of Trial Burn	Remarks
1. Spare Treatment Capacity	<ul style="list-style-type: none">● STF was designed to treat 2,000tpd sewage sludge, whilst there was about 1,034tpd (on average) treated in 2020. Sufficient spare capacity is available, prior to reaching the design capacity.
2. Spare Flue Gas Quantity	<ul style="list-style-type: none">● Specified Process (SP) Licence controls flue gas flowrate of 75,752Nm³/h (dry and 11% O₂) at each train.● Under the operation in 2020, each train would run with about 50,000Nm³/h. Sufficient spare flue gas flowrate is available.

Features of Trial Burn	Remarks
3. Similar but Less Noxious Nature of GTW Sludge	<ul style="list-style-type: none"> As elaborated in Para. 2 above, the GTW sludge would be in similar nature, but less noxious and less contaminated, especially concerning sulfur and chlorine.
4. Proper Handling and Transportation of GTW Sludge	<ul style="list-style-type: none"> Enclosed and water-tight container trucks will be deployed to deliver GTW sludge from the waste cooking oil recycling plant to STF.
5. Minimal Tonnage of GTW Sludge	<ul style="list-style-type: none"> GTW sludge tonnage will be gradually ramped up from 3 to 15tpd, generating about maximum of 2 to 3 delivery trips daily.
6. Close and Sophisticated Control and Monitoring System	<ul style="list-style-type: none"> Operation parameters during trial burn will be closely controlled and monitored at Central Control Room, in particular temperature and pollutant concentrations at flue gas emission (by both CEMS and regular stack gas sampling). Existing automatic cut-feed logic also securely protects from risks of abnormal operation and emission.

Possible Impacts on the Environment

14. Potential environmental impacts associated with the trial burn have been identified and described below based on the preliminary technical feasibility desktop study, covering all key environmental aspects assessed in the approved EIA Report (Register No.: AEIAR-129/2009).

Air Quality

15. The major air quality issues are the flue gas emissions arising from the GTW sludge co-treatment and the odour emissions arising from the GTW sludge delivery, unloading and storage.

Flue Gas Emissions

16. As mentioned above, the GTW sludge is similar in nature but significantly less noxious and less contaminated than the sewage sludge. Chemical analysis of GTW sludge and sewage sludge (from both Primary and Secondary STWs) are included in

[Appendix A](#) for reference. As presented in **Para. 2**, the GTW sludge contains much less sulfur and chlorine, of which would eventually contribute less hydrogen sulphide, hydrogen chloride, and dioxins respectively during delivery / storage and treatment.

17. As estimated in the trial burn plan, treatment of 1 tonne per hour (tph) of the GTW sludge is expected to generate around 5,500Nm³/h of flue gas expressed in dry and at 11% O₂. The total flue gas flowrate resulting from the co-treatment of sewage sludge and 1tph GTW sludge would be about 74,900Nm³/h at maximum (with safety margin included), therefore remain lower than that stated in the SP Licence (i.e. 75,752Nm³/h). 1tph GTW sludge would represent the case of up to 15tpd GTW sludge in average. During the trial burn, the flue gas flowrate will be closely monitored by the Central Control Room, and the GTW sludge feeding rate (in tph) will be controlled / cut accordingly, for compliance of the licence requirement.

18. In addition, sufficient flue gas treatment chemicals will be applied to ensure no exceedance to all the air pollutant concentration limits. Hence, both the concentration limits of any pollutants at the stack; and the flue gas flowrate would be in full compliance during the trial burn of the GTW sludge.

Odour Emissions

19. As mentioned in **Para. 2**, the GTW sludge is significantly less noxious and less contaminated, in particular low sulfur content which would contribute lower generation and release of odorous hydrogen sulphide. The said is supported and observed from the operation in the waste cooking oil recycling plant that the GTW sludge is stored outdoor without any odour suppression facility, however no significant odour impact occurs nor any associated odour complaint received during its operation.

20. Regarding transportation of the GTW sludge from the waste cooking oil recycling plant to STF, enclosed and water-tight container trucks will be deployed, with following features:

- gasket placed between gaps of tailgate to prevent any leachate spillage; and
- mechanical cover, with gasket placed at gaps, installed on top of the container, of which entirely encloses the container during transportation to prevent any odour nuisance.

21. Photos showing the abovementioned features are included in [Appendix C](#).

22. In addition to the above, the container trucks will be cleaned manually to remove GTW sludge residue, if any, after unloading at STF, to prevent any drag-out of GTW sludge causing odour nuisance during the returned trip. The container trucks would be washed, as needed, at depot at the end of each delivery day to ensure cleanliness.

23. Under current STF operation, dewatered sludge is delivered from STWs to STF by both marine and land transportations. Road transportation is adopted by those STWs without marine berthing / loading facilities.

24. In 2020, on average, there were about 380tpd dewatered sewage sludge delivered to STF by road transportation (via Lung Mun Road – Lung Kwu Tan Road – Nim Wan Road, by about 50 trucks daily).

25. Delivery of GTW sludge from the waste cooking oil recycling plant in EcoPark to STF will adopt the similar road transportation route as mentioned above and illustrated in [Appendix D](#). The trial would only require about 3 to 15tpd GTW sludge, additionally generating maximum of 2 to 3 trips daily (only about +6%). Having said that, considering the current treatment of about 1,034tpd in 2020 and the design capacity of 2,000tpd, the additional trips generated from the trial burn would be insignificant.

26. In view of the above (no new route, minimal contribution, and sealed containers), adverse odour impact during transportation is not expected.

27. During the trial burn at STF, the GTW sludge will be unloaded in enclosed delivery bays and stored in the bunker ventilated to deodourisation units. Hence, the odour impact to the surrounding during operation is expected negligible. Nevertheless, odour patrol will be conducted 3 times a week to monitor the odour level during the trial burn period.

Waste Management Implications

28. The main waste type associated with STF operation would be ash, comprising bottom ash and fly ash (residues). Residual impact arising from disposal of the ashes was considered to be minimal and thus acceptable. The ash leachability was reaffirmed by Toxicity Characteristic Leaching Procedure (TCLP) tests conducted during initial operation phase, for a period of 6 months under EM&A.

29. Considering the GTW sludge as similar nature, but less noxious and less contaminated than the sewage sludge, and only 3 to 15tpd GTW sludge to be introduced, it is anticipated that there is no increase in waste quantity nor type, and no change of disposal outlet. The abovementioned conclusion on waste management implication would remain unchanged.

Water Pollution

30. The following potential water quality impacts during the STF operation were identified and assessed in the approved EIA Report.

- (i) Wastewater generated from the STF operation;
- (ii) Discharge of saline water from the desalination plant; and
- (iii) Microbial emission associated with transportation, storage and handling of dewatered sewage sludge.

31. During the trial burn period, the GTW sludge trucks will be washed, as need, at depot at the end of each delivery, but not at STF. The amount of sanitary sewage (by plant personnel and commercial activities) and cooling water system would not be altered by the trial. Hence, no adverse water quality impact by (i) is expected.

32. The trial burn will not consume more water, thus no additional burden / change is to be introduced to the desalination plant of (ii). Discharge rate of saline water would remain unchanged within the licence limit of 1,500m³/d.

33. As highlighted in the above (Para. 12 and 19) and shown in Appendix C, enclosed and water-tight container trucks will be deployed to deliver GTW sludge from the waste cooking oil recycling plant to STF. The trucks will be washed, as needed, at the end of each delivery, and cleaned manually to remove residues / drag-out, if any. With the said control measures implemented, no unacceptable water quality impacts are expected.

Noise Impact

34. The approved EIA Report assessed the traffic noise impact due to off-site traffic generated from the STF operation, and the assessment results indicated that the predicted traffic noise would not result in significant increase in traffic noise impact to the noise sensitive receivers along Lung Kwu Tan Road.

35. The projected peak hour off-site traffic flows adopted in the abovementioned traffic noise impact assessment were 440 and 680 vehicles per hour at Lung Kwu Tan Road sections. Comparing to the said, the additional maximum of 2 to 3 trips daily from the trial burn would not cause any traffic burden, thus insignificant noise impact would remain.

Other Environmental Aspects

36. Operation of the trial burn would be confined within the STF site and would not alter / cause any physical change to the building structures and also no change to underground or confined space at STF. Together that GTW sludge is of similar nature to, but less noxious and less contaminated than the sewage sludge, conclusion in the approved EIA Report for the Sludge Treatment Facilities (Register No.: AEIAR-129/2009) on other environmental aspects would also remain unchanged.

Summary

37. As discussed in detail above, no change in the key environmental impacts associated with the trial burn would be anticipated. Below summarises the issues and relevant considerations.

Issue	Implication?	Measures to be Implemented / Remarks
Air Quality – Flue Gas Emissions	No	<ul style="list-style-type: none"> The flue gas flowrate will always remain under 75,752Nm³/h, as specified in the SP Licence, and be closely monitored. The GTW sludge feeding rate will be controlled / cut accordingly, for compliance of the licence requirement.
Air Quality – Odour Emissions	No	<ul style="list-style-type: none"> Enclosed and water-tight container trucks will be deployed for transportation of the GTW sludge from the waste cooking oil recycling plant to STF. The trial would only generate 2 to 3 trips daily.
Waste Management Implications	No	<ul style="list-style-type: none"> The ash leachability was reaffirmed by TCLP tests conducted under EM&A.
Water Quality	No	<ul style="list-style-type: none"> The enclosed and water-tight GTW sludge truck(s) will be washed, as needed, at depot at the end of each delivery. No additional wastewater would be

Issue	Implication?	Measures to be Implemented / Remarks
		generated at STF. <ul style="list-style-type: none"> ● The amount of sanitary sewage (by plant personnel and commercial activities) and cooling water system would not be altered by the trial. ● Discharge rate of saline water would remain unchanged within the licence limit of 1,500m³/d.
Noise Impact	No	<ul style="list-style-type: none"> ● The additional maximum of 2 to 3 trips daily from the trial burn would not cause any traffic burden and associated traffic noise impact.

No Material Change

38. In addition to the above, in accordance with the Environmental Impact Assessment Ordinance (Cap. 499) (EIAO), if there are any changes to a Designated Project, it is necessary to evaluate if the changes will constitute a "material change" under the definition of the EIAO. The definition of "material change" is presented in the Technical Memorandum of EIA Process (EIAO-TM).

39. As outlined in Section 6.1 of the EIAO-TM, changes under the circumstances (a) to (e) are regarded as "material changes". Having reviewed, the circumstances (a) to (e) are all considered not applicable to the proposed trial burn, thus no "material change" would be constituted by the proposed trial burn.

Conclusion

40. To sum up, there is no adverse environmental impact arising from the proposed trial. Potential impact on the environment and community is negligible. As the amount of GTW sludge for the trial burn is only marginal (3 to 15tpd) and with the following key measures / features, the environmental performance requirements set out in the EIA Report previously approved (Register No.: AEIAR-129/2009) are not exceeded nor violated.

- The treatment system will be closely monitored, to ensure compliance and stable operation, in particular treatment process at 850°C for at least 2 seconds residence time for complete combustion, as well as temperature and pollutant concentrations at flue gas emission (by both CEMS and regular stack gas sampling), together with the flue gas flowrate;

- The existing control logic of automatic cut-off systems will prevent or cut-off sludge feeding immediately into the treatment system if there is a risk of abnormal operation and emission, including treatment temperature of 850°C not maintained;
- Enclosed and water-tight container trucks will be deployed to deliver the GTW sludge, to prevent any odour nuisance; and
- In case of any incident / problem identified, the trial burn will be put on hold until resolved. Subject to the outcome of investigation, remaining GTW sludge would be disposed of at the WENT Landfill.

41. For additional measures to eliminate, reduce and control any adverse environmental impact arising from the proposal, a contingency plan (measures at [Appendix B](#)) has been set out in the trial burn plan. Moreover, a trial burn report (outline at [Appendix B](#)) will be submitted to the relevant authority afterwards.

Strategic Facilities Development and Planning Group
Environmental Protection Department
October 2021

GTW Sludge properties

Sampling date	Moisture content	VS	TS	O&G	TOC	GHV		LHV		Ash		C	H	O	N	S	Cl
						Wet	Dry	Wet	Dry	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry
	%	%	%	%	%	MJ/kg	MJ/kg	MJ/kg	MJ/kg	%	%	%	%	%	%	%	%
14-1-2020	58.40	93.80	41.60	23.90	81.60	10.90	26.20	8.80	24.60	2.85	6.86	57.05	7.50	23.81	4.10	0.72	0.12
15-1-2020	56.90	93.40	43.10	24.00	56.50	11.20	26.00	9.10	24.40	3.05	7.08	56.78	7.50	23.51	4.40	0.75	0.13
16-1-2020	57.00	93.50	43.00	23.10	54.80	11.70	27.30	9.60	25.60	2.79	6.48	58.21	7.78	22.57	4.20	0.79	0.12
17-1-2020	58.80	93.50	41.20	25.30	57.50	10.80	26.30	8.70	24.60	2.79	6.76	56.91	7.74	24.29	3.56	0.74	0.11
20-1-2020	58.60	92.00	41.40	24.60	59.90	10.70	25.80	8.60	24.20	3.33	8.03	56.31	7.60	23.09	4.12	0.85	0.14
21-1-2020	58.70	94.70	41.30	36.70	58.80	11.40	27.60	9.20	25.80	2.40	5.81	59.10	8.07	23.50	2.92	0.60	0.18
21-1-2020	56.50	92.40	43.50	22.10	64.40	11.10	25.60	9.00	24.00	3.39	7.79	56.05	7.56	23.84	3.96	0.80	0.10
23-1-2020	59.50	92.20	40.50	18.50	56.40	10.60	26.10	8.50	24.50	3.25	8.03	56.34	7.41	23.64	3.63	0.95	0.10
23-1-2020	60.60	92.90	39.40	24.30	55.80	10.50	26.60	8.40	25.00	2.92	7.40	57.22	7.58	24.04	3.10	0.66	0.11
10-2-2020	52.70	87.40	47.30	34.20	58.20	11.10	23.50	9.10	21.90	6.65	14.07	51.54	7.15	23.42	3.20	0.59	0.11
10-2-2020	63.50	93.70	36.50	54.30	62.80	10.00	27.30	7.80	25.50	2.14	5.87	58.54	8.08	24.58	2.50	0.45	0.13
11-2-2020	60.10	94.10	39.90	50.90	56.00	11.00	27.70	8.90	25.90	2.29	5.74	58.81	8.13	23.74	3.00	0.56	0.37
11-2-2020	60.00	95.40	40.00	65.40	65.30	12.30	30.80	10.10	28.90	1.83	4.59	63.50	8.77	20.61	2.20	0.32	0.37
AVERAGE	58.56	93.00	41.44	32.87	60.62	11.02	26.68	8.91	24.99	3.05	7.27	57.41	7.76	23.43	3.45	0.68	0.16
MAX	63.50	95.40	47.30	65.40	81.60	12.30	30.80	10.10	28.90	6.65	14.07	63.50	8.77	24.58	4.40	0.95	0.37
MIN	52.70	87.40	36.50	18.50	54.80	10.00	23.50	7.80	21.90	1.83	4.59	51.54	7.15	20.61	2.20	0.32	0.10

Primary Sludge and Secondary Sludge properties

Primary Sludge

Month	GHV	LHV	VS	C	H	O	N	S	Cl	Ash	Moisture content
	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
	MJ/kg	MJ/kg	%	%	%	%	%	%	%	%	
Jan-20	6.743	4.752	73.6	46.3	6.5	24.3	2.7	1.456	1.05	17.66	67.6
Feb-20	6.002	3.981	75.3	45.6	6.5	27.1	2.65	1.71	1.295	15.12	70.7
Mar-20	6.5	4.5	73.5	47	6.4	26	2.98	1.89	1.4	16	69
Apr-20	5.55	3.57	67.4	42	6	24.5	3.13	1.92	1.5	22.1	70.1
May-20	6.41	4.39	73.7	47	6.7	27.3	3.02	1.84	1.3	13.9	69.8
Jun-20	6.26	4.28	71.1	45	6.1	28.8	2.39	0.64	1.1	17	69.1
Jul-20	6.72	4.7	73.4	46	6.8	26.7	2.42	1.84	1	15.8	68
Aug-20	5.62	3.63	67.8	43	6	25.3	2.7	2.05	1.1	21	70.4
Sep-20	6.27	4.27	73.3	46	6.4	29	2.56	1.89	1.2	14	68.9
Oct-20	6.34	4.38	68.9	44	6.1	24.8	2.89	1.93	0.87	20	67.9
Nov-20	6.44	4.42	73	47	6.7	25.5	2.75	2.05	1.3	16.3	69.4
Dec-20	6.53	4.53	72.9	46	6.6	26.9	3.16	1.9	1.2	15.2	68.8
Average	6.28	4.28	71.99	45.41	6.40	26.35	2.78	1.76	1.19	17.01	69.14
Maximum	6.74	4.75	75.30	47.00	6.80	29.00	3.16	2.05	1.50	22.10	70.70
Minimum	5.55	3.57	67.40	42.00	6.00	24.30	2.39	0.64	0.87	13.90	67.60

Secondary Sludge

Month	GHV	LHV	VS	C	H	O	N	S	Cl	Ash	Moisture content
	Wet	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	
	MJ/kg	MJ/kg	%	%	%	%	%	%	%	%	
Jan-20	4.015	2.135	60.3	37.6	2.8	17.6	6.5	3.287	1.398	30.8	76.2
Feb-20	4.008	2.002	65.2	35	5.1	19.9	6.19	2.983	1.437	29.4	76.8
Mar-20	3.8	1.89	53.5	32	4.6	15.7	5.13	2.96	1.495	39.8	71.9
Apr-20	3.77	1.92	52.2	30	4.5	18	4.5	2.21	1.613	40	69.2
May-20	3.69	1.79	54.5	31	4.6	16	5.63	3.13	1.407	39.5	71.8
Jun-20	4.34	2.42	56.9	32	4.7	19.3	4.93	1.64	1.18	37.1	71.2
Jul-20	3.48	1.5	57.2	31	4.9	19	5.3	2.86	1.61	36.8	74.8
Aug-20	3.67	1.69	59.4	32	4.9	18.9	5.49	3.22	1.4	34.9	74.9
Sep-20	3.91	1.93	60.8	34	5	20	5.81	2.91	1.263	32.3	74.3
Oct-20	4.05	2.06	63.7	36	5	19.7	6.13	2.84	1.05	30	75.1
Nov-20	3.62	1.63	60.8	33	5	20	5.65	2.66	1.21	33.6	75.7
Dec-20	3.78	1.78	61.1	35	5.1	18.9	6.14	2.91	1.21	32.3	75.7
Average	3.84	1.90	58.80	33.22	4.68	18.58	5.62	2.80	1.36	34.71	73.97
Maximum	4.34	2.42	65.20	37.60	5.10	20.00	6.50	3.29	1.61	40.00	76.80
Minimum	3.48	1.50	52.20	30.00	2.80	15.70	4.50	1.64	1.05	29.40	69.20

Appendix B – Key Information of Trial Burn Plan

Trial burn schedule		
Trial burn arrangement		
Plant used for the trial : To be confirmed		
Incineration train used for the trial : To be confirmed		
Monitoring during the trial burn		
Parameters	Frequency	Comments
	Day1 to Day42 *	
Volumes of GTW Sludge treated	Weight of each delivery recorded using the weighbridge system	
GTW Sludge properties :		
moisture	Daily samples collected for analysis on each day when reception takes place (tentatively 6 times per week)	
volatile solid		
oil & grease		
C,H,O,N,S,Cl		
ash content		
Net Calorific Value		
Incinerator operation parameters :		
oxygen level at the post combustion chamber	Continuous monitoring	refer to clause 46 of the SP licence
temperature of the flue gases at the post combustion chamber after the last injection of combustion air		
Flue gas emission parameters:		
oxygen and carbon dioxide	Continuous monitoring	refer to clause 46 of the SP licence
flue gas temperature, water vapour content and volumetric flow rate		
Particulates		
vaporous organic substances (expressed as TOC)		
hydrogen chloride		
hydrogen fluoride		
sulphur dioxide		
nitrogen oxides (expressed as NO2)		
carbon monoxide		
ammonia		
Flue gas emission parameters:		
Cd+Tl	Periodic monitoring : at least once during the trial burn period.	refer to clause 50 of the SP licence
Hg		
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V		
Dioxins and Furans		
* the exact duration will be adjusted during the trial		

Contingency Plan for Trial Burn

In case the trial shows that the treatment of GTW Sludge has potential risk of undesirable negative impacts on the operation (whether on safety, sludge conveying system, odour, combustion, or any other topics), the trial may have to be interrupted.

The following contingency measures will be implemented:

1. In case of an issue with the unloading bay, the deliveries will be interrupted until the problem is fixed.
2. In case of anomaly detected before tipping (e.g. foreign objects), the truck will be diverted to WENT Landfill.
3. In case of an issue with the sludge conveying system used for the trial (e.g. secondary sludge screw conveyor blockage), the deliveries to STF will be interrupted until investigations on the causes of the incident are identified and the implication of the grease properly assessed.
4. In case of an issue with the incinerator used for the trial (e.g. it must be shutdown), the deliveries to STF will be interrupted until the incineration train is back in operation.
5. More generally, in case of issue that requires further investigation (e.g. unusual odors), the deliveries to STF will be interrupted until the investigations are completed and normal operation can resume.
6. In case the trial reveals that the incineration of GTW sludge in STF must be discontinued, the deliveries will be stopped and, if required, the remaining volumes of GTW sludge will be removed from the bunker and sent to WENT Landfill.
7. Admission tickets would be applied in advance, in order to allow the GTW sludge or mix of sewage sludge and GTW sludge to be diverted from STF to WENT Landfill under the situation that the trial is suspended.

Trial Burn Report

The following information will be included in the trial burn report:

1. Daily volumes of GTW Sludge received;
2. GTW sludge analysis results;
3. Daily volumes of sludge + GTW sludge incinerated in the train used for the trial burn;
4. Daily ratio of treated mix of secondary sludge and GTW sludge: $[\text{secondary sludge} + \text{GTW sludge}] / [\text{secondary sludge} + \text{primary sludge} + \text{GTW sludge}]$;
5. Combustion parameters (post combustion temperature and oxygen content in boiler);
6. CEMS reports;
7. Monthly TOC and dioxins test results for ashes and residues (at least one test for both);
8. Monthly stack gas analysis result (at least one test);
9. Fuel consumption; and
10. Description of incidents, if any.

Appendix C – Photos of Enclosed and Water-tight Container Truck for GTW Sludge Delivery



Photo 1 – Enclosed and Water-tight Container Truck for GTW Sludge Transportation



Photo 2 – Loading of GTW Sludge to Enclosed and Water-tight Container Truck at the Waste Cooking Oil Recycling Plant



Photo 3 – Top Cover of Enclosed and Water-tight Container Truck



Photo 4 – Sealing of Top Cover



Photo 5 – Sealing of Container Tailgate



Photo 6 – Enclosed and Water-tight Container Truck on Lung Mun Road

Appendix D – Road Transportation Routes to STF

