



Knolton Farmhouse Cheese

Summary of H1 Findings

1. Background

Knolton Farmhouse Cheese Limited has a permit for effluent treatment discharge under Permit CG0408201 for the treatment of liquid waste from the dairy processes carried out on site. The H1 risk assessment has been applied for the variation to only increase the volume discharge rate from 800m³ per day to 1,500m³ per day and increase the discharge temperature from 25°C to 30°C. The site has had occasions where the temperature and daily discharge volume has been exceeding the parameters set in the current permit.

2. Location of the site to sensitive receptors

The site is 384 metres from the River Dee which is designated as a Site of Special Scientific Interest (SSSI) and a Special Area of Conservation (SAC). The site discharge point (NGR SJ36181 41183) is into the River Dee.

3. Applying the H1 tool software

The Environment Agency H1 risk assessment software has been used to carry out two risk assessments to assess the impact of increasing the daily discharge volume and increase the discharge temperature.

3.1 Risk assessment one

To assess the current data for the site for the release of aluminium following treatment to control phosphate on the River Dee. The assessment is based on the discharge data January 2022 to September 2023 see Table 3 and the base line information within the H1 summary accompanying the variation application in 2019, refer to Appendix G– KFC Summary H1 pdf document were applied to the H1 tool. The temperature, volume daily discharge and pH have been based on the highest figures in Table 1 and Table 2 taken on site.

3.2 Risk assessment two

To assess the impact of the release of aluminium at the permitted level set in the permit by increasing the discharge volume rate to 1,500m³ per day and a maximum discharge temperature of 30°C.

3.3 Phosphorus

Phosphorus was not included in this assessment as the H1 tool does not deem this as a requirement. The aluminium is used to reduce the phosphate levels prior to being discharged from the site.

4. Analytical data

Below is the data for the average and highest levels for temperature, pH and the volume daily discharge rate in metres cube for the site.

Table 1 below is data taken on site from January to December 2022. Table 2 is data from September 2022 to September 2023.



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Table 1 Knolton Farmhouse Cheese on site monitoring data January to December 2022

January to December 2022		
	Average for the year 2022	Highest value 2022
Temp °C	21.8	27.8
pH	8.00	9.00
Daily Volume Discharge m3	292	828*

*The highest daily discharge volume was on 23/12/2022 and we never breached the volume on any other day that year.

Table 2 Knolton Farmhouse Cheese on site monitoring data September 2022 to September 2023

September 2022 to September 2023		
	Average for 09/22 – 23	Highest value 09/22-23
Temp °C	21.98	27.5
pH	8.05	9.00
Daily Volume Discharge m3	488	1041*

*The highest daily discharge volume was on 20/05/2023

Table 3 below, is the data from the samples taken and analysed by an accredited laboratory (Intertek Food (UK)) from the discharge sample point.

The samples are from January 2022 to October 2023. The site has had several exceedances for the aluminium against the current permit conditions. However, as noted in the variation application submitted in 2019, the aluminium is still below the level of significance and that the highest figure for sample taken on 4th August 2022 was inputted into the H1 tool software for both risk assessments one and two.

The site is taking steps to ensure that the dosing of aluminium as part of the treatment of the waste water does not breach the conditions of the permit. The site is currently reviewing and updating the Environment Management System (EMS) (Appendix F is the current EMS) to reflect the actions required to ensure the site remains compliant with the permit.



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Table 3 Laboratory Sample Results from January 2022 to October 2023 for Knolton Farmhouse Cheese Limited

Knolton Farmhouse Cheese Limited – Laboratory Sample Results January 2022 to October 2023												
Receipt Date	Sample Date	Sample Time	Test Date	Report Date	Time	mg/l to ug/l	Aluminium in Water ug/l 1000ug	pH 6-9	Phosphorus in Water mg/l 2mg	Suspended Solids mg/l 60mg	Biological Oxygen Demand mg/l 50mg	Chemical Oxygen Demand mg/l
10/01/2022	07/01/2022	08:30	25/01/2022	25/01/2022	16:56	399	399	8.2	0.29	19	6	43
01/04/2022	22/03/2022	08:30	28/04/2022	29/04/2022	09:04	550	550	8.6	0.41	48	3	63
13/05/2022	12/05/2022	10:45	07/06/2022	07/06/2022	16:11	527	527	8.3	<0.12	18	<1	55
27/05/2022	26/05/2022	10:28	20/06/2022	21/06/2022	09:04	497	497	8	<0.12	17	<1	57
13/07/2022	12/07/2022	09:50	08/08/2022	07/09/2022	16:48	-	-	8.1	0.25	24	<1	55
05/08/2022	04/08/2022	11:00	07/09/2022	07/09/2022	16:48	1520	1520	8	0.36	42	1	67
12/09/2022	08/09/2022	14:45	04/10/2022	04/10/2022	14:44	587	587	7.7	0.46	26	4	40
14/10/2022	13/10/2022	08:00	07/11/2022	07/11/2023	17:16	249	249	8.2	<0.12	10	1	33
11/11/2022	11/11/2022	-	05/12/2022	06/12/2022	08:57:26	1430	1430	8.1	-	54	3	42
10/02/2023	13/01/2023	-	14/02/2023	28/02/2023	09:23:08	-	-	-	0.27	44	2	-
17/02/2023	16/02/2023	10:00	06/03/2023	06/03/2023	16:41	1.5	1.5	8.5	0.42	19	4	58
17/03/2023	16/03/2023	09:45	05/04/2023	05/04/2023	17:57	420	0.42	7.9	0.17	16	1	32
21/04/2023	20/04/2023	10:35	07/06/2023	20/04/2023	12:18	870	0.87	8.3	0.14	14	4	31
19/05/2023	01/05/2023	-	19/05/2023	06/06/2023	16:59:38	1.4	1.4	8	0.39	24	3	38
09/06/2023	08/06/2023	10:00	09/06/2023	29/06/2023	12:19	550	0.55	8.3	0.12	10	2	53
16/06/2023	15/06/2023	12:15	16/06/2023	06/07/2023	12:18	670	0.67	8.4	0.14	16	2	43
23/06/2023	22/06/2023	09:30	23/06/2023	19/07/2023	13:55	350	0.35	8.5	0.25	12	3	44
30/06/2023	29/06/2023	09:15	30/06/2023	02/08/2023	20:05	670	0.67	7.9	0.27	20	5	51
07/07/2023	06/07/2023	-	21/08/2023	21/08/2023	16:59	1300	1.3	7.9	0.3	24	4	31
21/07/2023	20/07/2023	10:00	16/08/2023	16/08/2023	14:02	460	0.46	8.2	0.42	17	1	33
04/08/2023	03/08/2023	09:00	04/08/2023	30/08/2023	16:54	390	0.39	8.1	0.29	24	2	16
04/09/2023	31/08/2023	-	27/09/2023	27/09/2023	10:56	440	0.44	8.5	0.29	12	<1	18
13/10/2023	12/10/2023	09:20	30/10/2023	30/10/2023	17:15	710	0.71	8.4	0.41	21	1	24
No Data	Breach of current permit conditions				Average	709.325		7.9-8.5	0.3616	28.083	3.166	45.583



5 Watercourse – River Dee

The pH of the receiving water, River Dee is 6.54, as identified in [Natural Resources Wales / Updated water quality targets for Welsh river SACs 2022](#). Refer to ‘document wq-sac-targets-Jan-2021-Exxternal(1) – Temp of the River Dee’ on the link above.

6 Waste inventory

The sludge generated from the effluent treatment plant is not expected to change, all sewage sludge is removed from the site to a permitted anaerobic digestion facility for recovery under European Waste Code (EWC) 02 05 02 – sludges from on-site effluent treatment. See Figure 1 below from the H1 Tool Risk Assessment.

Waste Stream Summary Tables							
Option		Impact Score		Normalised Impact			
Option 1 - Existing Data		160000		1			
<u>Number</u>	<u>Waste Stream:</u>	<u>Quantity:</u>	<u>Method</u>	<u>Score:</u>	<u>Waste Category:</u>	<u>Score:</u>	<u>Impact Score:</u>
1	Non-hazardous sewa	5000	Biological treatment with energy	8	biodegradable non-hazardou	4	160000
Option 2 - Proposed Data		160000		1			
<u>Number</u>	<u>Waste Stream:</u>	<u>Quantity:</u>	<u>Method</u>	<u>Score:</u>	<u>Waste Category:</u>	<u>Score:</u>	<u>Impact Score:</u>
1	Non-hazardous sewa	5000	Biological treatment with energy	8	biodegradable non-hazardou	4	160000

Figure 1 Waste stream summary table which is not expected to change.

7 Energy

The site uses a combination of electricity, mains supply (grid) and from on-site solar arrays. The sites uses the energy generated by the solar arrays; any excess is exported to the grid. The site does not have the facility to store energy on site. Energy is not expected to increase on site at present, however, as the site increases its output, this is expected to increase, this will be reviewed periodically. Knolton Farmhouse Cheese is part of the dairy industry climate control agreement. This agreement sets targets for energy efficiency within the dairy industry. Refer to Appendix M.

8 Water

The borehole supplies water for the site. This is under licence number WA 067 007 0014 (valid from 30.06.2017 to 31.03.2027) which permits 30m³ an hour, 720m³ per day or 262,800m³ a year (no more than 8.3 litres a second).



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9. Applying the H1 tool software – Risk assessment one

Risk assessment one is based on existing data take on the site as set out in Section 4, Tables, 1, 2 and 3 above.

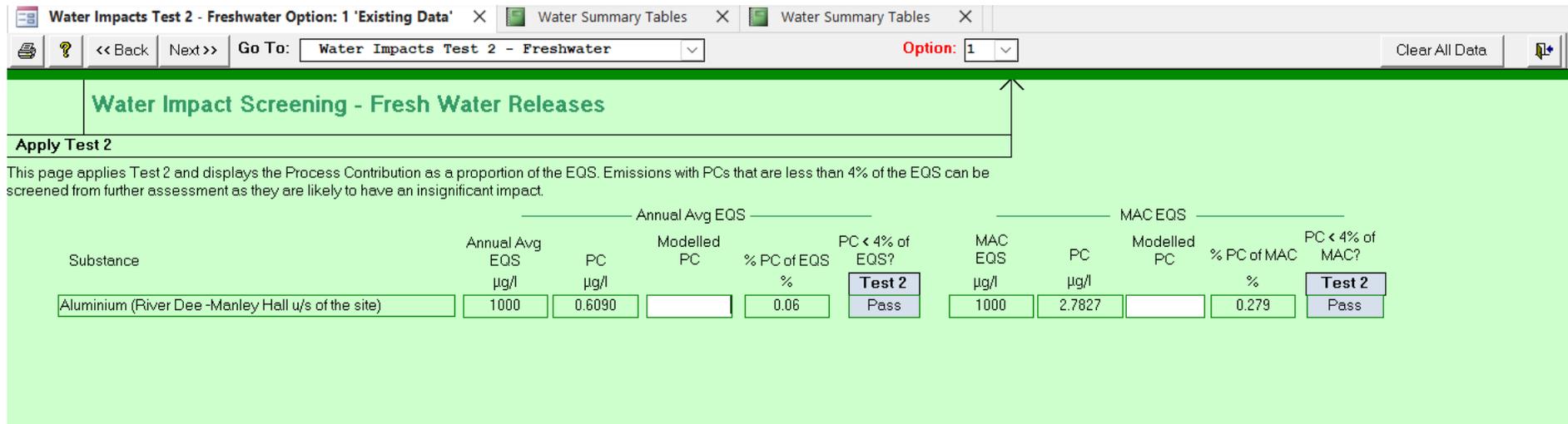


Figure 2 Existing analytical data from section 4 applied to the H1 tool software



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10. Risk assessment One – Release concentration present in discharges to water

Figure 3 below is based on the analytical data from samples taken by the accredited laboratory from January 2022 to October 2023. Refer to Tables 1,2 and 3 in Section 4 of this document on the current effluent treatment discharge analytical data.

Water Emissions Inventory Option: 1 'Existing Data' | Water Summary Tables | Export to Opra Profile | Water Summary Tables

Go To: Water Emissions Inventory | Option: 1 | Clear All Data

Release Concentrations of Substances Present in Discharges to Water

Please list all Substances released to Water for each Release Point identified in the previous page.

Which type of assessment method are you using? Continue with the method below.
(See help box & H1 Annex D for information)

Method: | Reference:

Number	Substance	Meas'ment Method	Operating Mode (% of Year)	Average Concentration in the Effluent (AA)		Maximum Concentration in the Effluent (Max)		Annual Rate kg/yr	Significant Load (PHS Only) kg/year
				Conc. µg/l	Meas'ment Basis	Conc. µg/l	Meas'ment Basis		
e.g.	chromium	Estimated*	continuous	0.20	annual avg	0.20	15 minute	380	1
1	Aluminium	Spot	100.0%	709	Annual Avg	1520	Spot	126.23376	

Figure 3 Risk assessment one water emissions inventory based on existing data



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11. Risk assessment one – temperature

Figure 4 Existing data taken on site in Tables 1 and 2.

Water Temperature Option: 1 'Existing Data' | Water Summary Tables | Export to Opra Profile | Water Summary Tables

Go To: Water Temperature | Option: [v] | Clear All Data

Water Temperature

Where relevant, please enter temperature of effluent for each release point.

This table is to check that the effluent is acceptable, i.e. within the required temperature range. It is not used to make relative judgement between options.

Discharge Location	Release Point	Measurement Method	High Normal Rate	High Peak Rate	Max Temp. Difference	Benchmarks		
						Max Summer	Max Winter	Max Temp Diff
1 River Dee -Manley Hall w/	1 Outlet 1	Continuous	21.98	27.8	0.0	21.5	10	2

Comments: Refer to Appendix E for H1 Summary Average mean temperature based on Sept 22 - Sept 23, 21.98oC. Max temp based on Jan 22 - Dec 22, 27.8oC.

Figure 4 Risk assessment one - recorded discharge temperature impact based on existing data



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12. Proposed variation – Risk assessment two

Figure 5 Risk assessment two - proposed variation to increase volumn discharge rate and temperature.

Water Impacts Test 2 - Freshwater Option: 2 'Proposed Data' | Water Summary Tables | Export to Opra Profile | Water Summary Tables

Go To: Water Impacts Test 2 - Freshwater | Option: 2 | Clear All Data

Water Impact Screening - Fresh Water Releases

Apply Test 2

This page applies Test 2 and displays the Process Contribution as a proportion of the EQS. Emissions with PCs that are less than 4% of the EQS can be screened from further assessment as they are likely to have an insignificant impact.

Substance	Annual Avg EQS					MAC EQS				
	Annual Avg EQS µg/l	PC µg/l	Modelled PC	% PC of EQS %	PC < 4% of EQS? Test 2	MAC EQS µg/l	PC µg/l	Modelled PC	% PC of MAC %	PC < 4% of MAC? Test 2
Aluminium (River Dee -Manley Hall u/s of the site)	1000	0.9978		0.10	Pass	1000	3.9530		0.396	Pass

Figure 5 Risk assessment two - impact from increased volume discharge rate 1,500m³ and temperature to 30°C



13. Risk assessment two – Release concentration present in discharges to water

Figure 6 is the H1 tool applied to the proposed variation to increase the daily volume discharge to 1,500m³/day and increase the discharge temperature to 30°C.

Water Emissions Inventory Option: 2 'Proposed Data' X Water Summary Tables X Export to Opra Profile X Water Summary Tables X

Go To: Water Emissions Inventory Option: 2 Clear All Data

Release Concentrations of Substances Present in Discharges to Water

Please list all Substances released to Water for each Release Point identified in the previous page.

Which type of assessment method are you using? Continue with the method below.
(See help box & H1 Annex D for information)

Method: Reference:

Number	Substance	Meas'ment Method	Operating Mode (% of Year)	Average Concentration in the Effluent (AA)		Maximum Concentration in the Effluent (Max)		Annual Rate kg/yr	Significant Load (PHS Only) kg/year
				Conc. µg/l	Meas'ment Basis	Conc. µg/l	Meas'ment Basis		
e.g.	<input type="text" value="chromium"/>	<input type="text" value="Estimated*"/>	<input type="text" value="continuous"/>	<input type="text" value="0.20"/>	<input type="text" value="annual avg"/>	<input type="text" value="0.20"/>	<input type="text" value="15 minute"/>	<input type="text" value="380"/>	<input type="text" value="1"/>
1	<input type="text" value="Aluminium"/>	<input type="text" value="Spot"/>	<input type="text" value="100.0%"/>	<input type="text" value="709"/>	<input type="text" value="Annual Avg"/>	<input type="text" value="1500"/>	<input type="text" value="spot"/>	<input type="text" value="207.02220"/>	<input type="text"/>

Figure 6 Risk assessment two - water emissions inventory on increased volume discharge rate and temperature



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14. Risk assessment two – temperature increase

Figure 7 Risk Assessment two. The water temperature is based on the current data taken on site, refer to Table 1. The highest normal rate of 21.98°C was recorded on site and the proposed temperature to discharge is at a maximum of 30°C from the site.

Water Temperature Option: 2 'Proposed Data' | Water Summary Tables | Export to Opra Profile | Water Summary Tables

Go To: Water Temperature | Option: 2 | Clear All Data

Water Temperature

Where relevant, please enter temperature of effluent for each release point.

This table is to check that the effluent is acceptable, i.e. within the required temperature range. It is not used to make relative judgement between options.

Discharge Location	Release Point	Measurement Method	High Normal Rate	High Peak Rate	Max Temp. Difference	Benchmarks		
						Max Summer	Max Winter	Max Temp Diff
e.g. continuous			10	15				
1 River Dee - Manley Hall w/	1 Outlet 1	Periodic*	21.98	30	0.0	21.5	10	2

Comments: Average based on Sept 22-Sep 23, 21.98oC. Max based on highest discharged Jan 22 - Dec 22, 27.5oC.

Figure 7 Risk assessment two - water temperature



15. Water Summary Tables

Table 4 below is the summary from the H1 tool based on the existing data and the proposed variation to increase the volume discharge rate per day to 1,500 litres and discharge temperature of 30°C.

Table 4 Water summary tables H1 Tool Software for existing and proposed data

Water Summary Tables							
Option 1 - Existing Data							
Release Points							
Number	Description	Location	Sewer	Effluent Flow Rate	Final Discharge Category		
1	Outlet 1	SJ3618141183	Nd	0.005648	R	River Flow (m3/s) :	6.57
				m3/s			
Long Term Impact							
Substance Assessed (Location)	Background Contribution	EQS	PC	PEC	% PC of EQS	% PEC of EQS	EQ
	µg/l	µg/m3	µg/m3	µg/m3			
Aluminium	River Dee - Manley Hall u/s of the site	1000	0.99778	0.00	0.10	0.00	0.00
Total:							0.00
Short Term Impact							
Substance Assessed (Location)	Background Contribution	EQS	PC	PEC	% PC of EQS	% PEC of EQS	EQ
	µg/l	µg/m3	µg/m3	µg/m3			
Aluminium	River Dee - Manley Hall u/s of the site	1000	3.95303	0.00	0.40	0.00	0.00
Total:							0.00
Option 2 - Proposed Data							
Release Points							
Number	Description	Location	Sewer	Effluent Flow Rate	Final Discharge Category		
1	Outlet 1	SJ3618141183	Nd	0.009259	R	River Flow (m3/s) :	6.57
				m3/s			
Option Summary							
Long Term Option Summary							
Substance Assessed	Option	% PC of EAL	% PEC of EAL	EQ			
Aluminium	1			0.00			
	2			0.00			
Water Summary Tables				Page 1 of 1			



16. Findings from the H1 tool software

Risk assessment one

Figures 2,3 and 4 - Risk assessment one is based on existing data the site holds. This was from the site continuous monitoring carried out on site for pH, temperature and daily discharge volume. Refer to Table 1 and Table 2 for the data.

The analytical data from accredited laboratory was applied using the highest figures to risk assessment 1. Refer to Table 3 for the analysis of the samples report.

Risk assessment two

Figure 5, 6 and 7 applied the increase in the daily discharge volume to 1,500m³/per day and increase in discharge temperature to 30°C.

Appendix G relate to the aluminium variation issued in July 2020. The figures were applied to the H1 Tool along with the analytical results in Table 3 to identify any risks with the proposed variation.

Following Risk Assessment 2 for the proposed variation, the impact of the chemical dosing of the aluminium for the long term is below the environmental quality standard (EQS) 1000µg/l with the process contribution (PC) at 0.9978µg/l. The percentage process contribution of the environmental quality standard (EQS) is 0.10%.

The short-term impact process contribution is 3.95303µg/l, the percentage of the Process Contribution (PC) of the Maximum Allowable Concentration (MAC) is 0.396%.

Summary and Conclusions

The proposed increase in daily discharge volume to 1,500m³/per day and increase in discharge temperature to 30°C of the aluminium would be within the EQS into the River Dee.