

DAIRY PARTNERS (CYMRU WALES) LIMITED

H1 SCREENING ASSESSMENT & WATER AND TRADE
EFFLUENT SAMPLING AND ANALYSIS



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(Cymru Wales) Ltd**

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DAIRY PARTNERS (CYMRU WALES) LIMITED

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1.0 INTRODUCTION

In late 2019 Dairy Partners cheese-making facility sited in Newcastle Emlyn, Carmarthenshire, SA38 9DQ, decided to replace their aged existing effluent treatment plant (ETP) which has a discharge point on the Afon Teifi (receiving water) at NGRSN 31356 40462 and replace it with a modern more efficient effluent treatment system which would use the current Best Available Technology and give a robust reliable treatment system.

Dairy Partners commissioned Redox Water Technologies based in Winterswijk in The Netherlands to design and build the new effluent system to meet the treated water quality parameters given in Table 1.

Table 1. ETP Installation Target Treated Water Quality

Target Treated Water Quality		
Parameter	Unit	Value
BOD5	mg/l	≤ 20
TSS	mg/l	≤ 30
Ammonia as N	mg/l	≤ 10
Nitrite as N	mg/l	≤ 1
Phosphate as P	mg/l	≤ 1
Aluminium	mg/l	≤ 1
Mercury	µg/l	≤ 0.5
Cadmium	mg/l	≤ 0.01

The design was created using current and future projected raw effluent flows and volumes along with chemical analysis data for Key Determinands for the raw untreated effluent carried out by Decus Research Ltd. Laboratories. The design report is included in Appendix A and contains all the relevant data used in the design process.

In October 2020 Dairy Partners submitted an application to NRW requesting a variation to their permit (EPR/WP3231NB) to discharge into the Afon Teifi at their cheese making site in Newcastle Emlyn, Carmarthenshire, SA38 9DQ, in order to allow the new ETP, which replaces their existing ETP, to be used. As part of this application process NRW requested that a risk assessment is undertaken to consider the impact of the proposed discharge on the Afon Teifi.

In October 2020 Dairy partners commissioned Envireau Water to carry out a Risk assessment to determine the likely impact, if any, on the River Teifi of the effluent being discharged by the new effluent treatment plant using the flow and determinand concentrations given in the new permit application. This report is given in Appendix B.

NRW are concerned that the increasing cheese production in the future would cause the maximum permitted daily flow conditions to be exceeded. In line with The Environmental Permitting (England & Wales) Regulations 2016, an increase in the maximum capacity of the installation obligates the 'operator' to revise the risk assessment (RA).

Natural Resources Wales (NRW) issued an 'Improvement Condition' (IC17) concerning the EPR/WP3231NB permit, obliging Dairy Partners (DP) to review the risk assessment.

DP has commissioned ExCAL Limited to perform a revision of the 2020 risk assessment (RA), used by the NRW to inform the latest permit variation.

The RA exercise comprising water and effluent sampling, and testing was conducted using the 2020 RA methodology (by Envireau Ltd) for data consistency and comparability. The testing and analysis were carried out by a UKAS-accredited laboratory (Decus Ltd) to achieve the highest standards for detection limits.

This report provides the background, risk assessment process, results, analysis, and conclusions.

2.0 SITE SETTING

DP is located in Newcastle Emlyn, SA38 9DQ off the B4333 (Grid Ref: SN 31562 40172). The Afon Arad, a tributary of the Afon Teifi (AT), runs along the eastern boundary of the DP site in a northerly direction. The installation is approximately 270m south of the AT (Figure 1). A plan showing the DP site is presented in Figure 2.

2.1 Receiving Water Body Afon Teifi

The AT is one of the longest rivers in South West Wales at 122km. Its source is Llyn Teifi in the Cambrian Mountains. In its upper course, the primary land use is moorland and forestry. Midstream, the river reaches dairy and livestock rearing, a dominant landscape feature. In the lower catchment, dairy industries are more abundant. Along its course, AT passes several small towns, including Lampeter, Newcastle Emlyn, and Cardigan. Notably, AT supports salmon and sea trout fisheries of national importance (Ref. 1, 2).

The Water Framework Directive (WFD) status of the Afon Teifi, along the DP site, is GOOD regarding its ecological condition and chemical status (Ref. 2). Despite this, it should be acknowledged that downstream of the site where the Afon Ceri confluences with the AT, the WFD status drops to MODERATE. It is noted that the water quality in some reaches of the AT is impacted by abandoned metal mines, which result in legacy pollution of the watercourse.

Figure 1. Dairy Partners Limited Site Location (Red Marker Point) Including Local SAC Sites

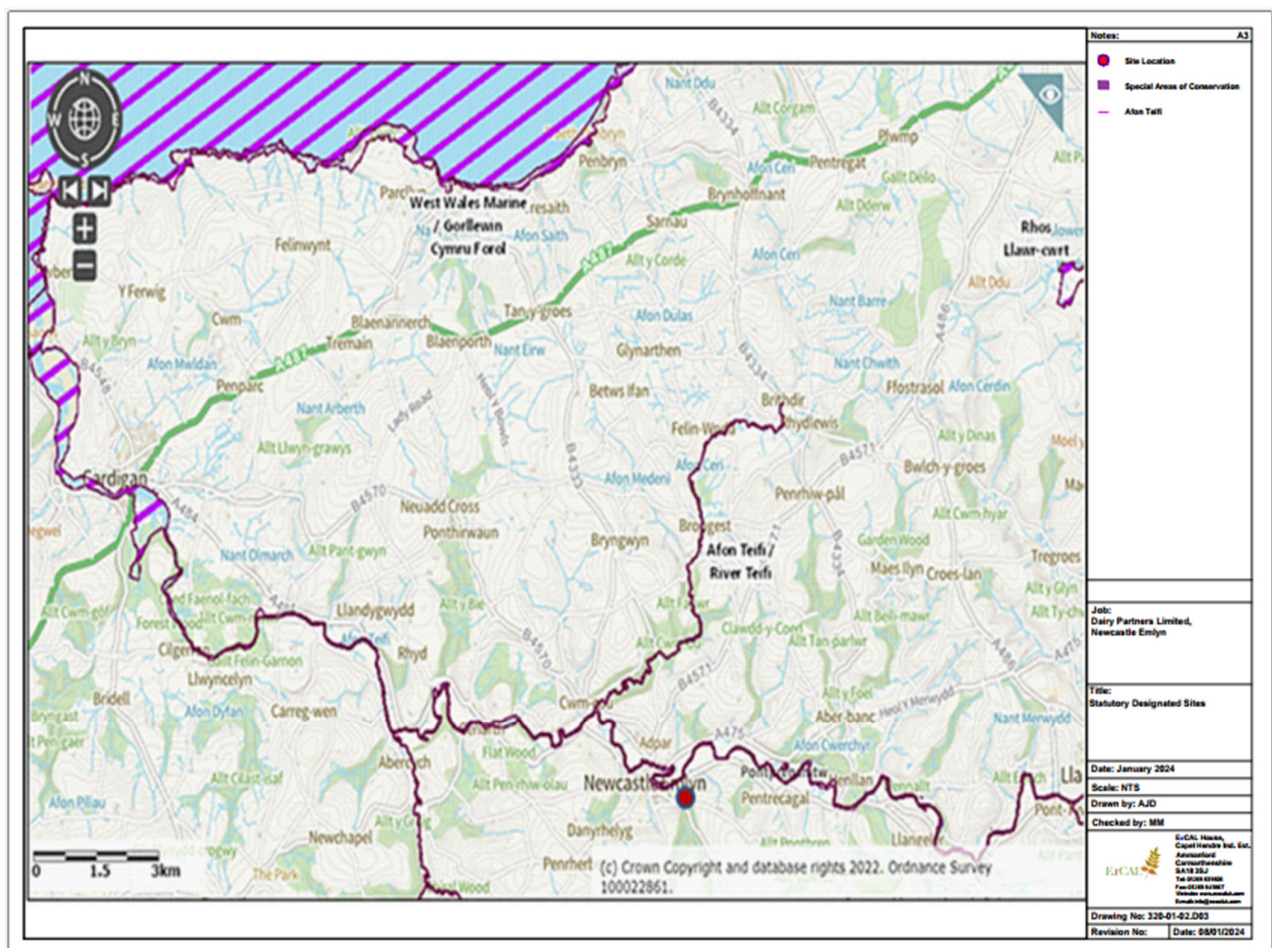
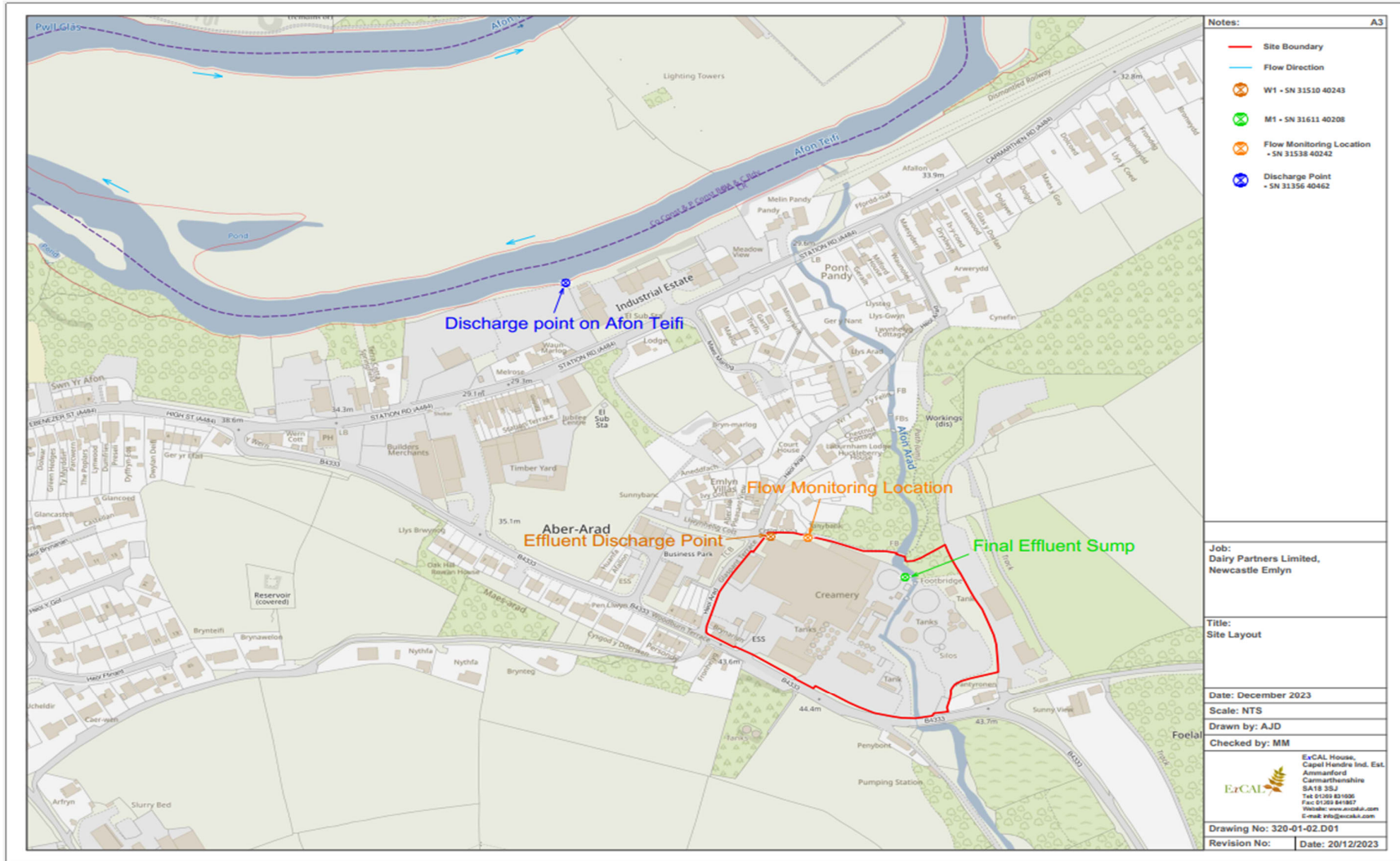


Figure 2. Dairy Partners Limited Site Layout



2.2 Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI)

AT is designated as both a Special Area of Conservation (SAC) and a Site of Special Scientific Interest (SSSI) (Figure 1) It provides an essential habitat for several vegetative species associated with watercourses at plain to montane levels, including water-crowfoots (*Ranunculus* spp.), floating water-plantain (*Luronium natans*) and callitricho-batrachion vegetation (Ref. 3).

Furthermore, the river is home to the Atlantic salmon, European Bullhead, Brook Lamprey, River Lamprey and the Eurasian Otter (Ref. 3).

The 2020 report on Compliance Assessment of Welsh River SACs against Phosphorus Targets by Natural Resources Wales (NRW) shows that of the water bodies assessed in the Teifi, eight pass and eight fail to achieve the AT SAC targets (Ref. 4).

The latest findings presented by the updated Source Appointment Graphical Information System model (SAGIS) by NRW (December 2022) indicate that, under current conditions, approximately 45 (kg/d) of phosphorus is discharged from the AT catchment daily and that the effluent from sewage treatment works account for a significant 66% of the average daily load in lower river sections (Ref. 5).

2.3 Water Quality Targets

The AT’s most up-to-date water quality targets (WQT) were given by the NRW guidance and derived from the UK Government website. Targets set for freshwaters priority hazardous substances under the Water Framework Directive (WFD), set by the Environment Agency (EA) and DEFRA (Ref. 6), were presented in Tables 2 and 3.

Targets derived from the WFD include Annual Average Environmental Quality Standards (AA- EQS) and Maximum Allowable Concentrations (MAC). In line with the NRW guidance, each target parameter may be assessed against both AA-EQS and MAC standards.

The WQT for SAC rivers, which present key water quality indicators including total ammonia, unionised ammonia, biological oxygen demand (BOD), pH and phosphorus, were specified by the NRW in the ‘Updated Water Quality Targets for Welsh River SACs 2022’ document (Ref. 7). They are set for individual SAC subsections of AT (‘waterbody names’).

The target values of the AT subsection between ‘Teifi - Afon Clettwr to Afon Ceri’ and ‘Afon Ceri to Estuary’ are relevant due to the DP site location and need to be used for this risk assessment.

Table 2. EA & DEFRA Water Quality Targets (Freshwater Priority Hazardous Substances) (Teifi - Afon Clettwr to Afon Ceri as Relevant Waterbody Names)

Parameter	AA-EQS	MAC
Aluminium (total) *	Not available	10 mg/L, (pH ≤6.5)
Aluminium (dissolved)*	Not available	1 mg/L
pH	Not available	6.0 – 9.0 (95th percentile)
Mercury and its compounds - (dissolved)	Not available	0.07 µg/L
Cadmium and its compounds (dissolved) water hardness 40mg to less than 50mg	0.08 µg/L	0.45 µg/L

* Water Framework Directive Annex VIII (England and Wales by EA)

**Subject to a maximum of 1:10 dilution

Aluminium is not included for testing in the H1 Tool, but must be considered for the risk assessment due to being a component of chemical used on the DP site (in line with the 2020 report).

Table 3. Updated Water Quality Targets for Welsh River SACs 2022

Parameter	Target (mg/L)
Mean BOD	1.5
90%ile total ammonia (NH3-N)	0.2
95%ile un-ionised ammonia (NH3-N)	0.025
Soluble Reactive Phosphorus (For - Low altitude, low alkalinity, river *)	20
pH	>6.54
Phosphorus standard (mg/L)	0.020

3.0 CURRENT DISCHARGE PERMIT CONDITIONS

DP's reviewed discharge permit number EPR/WP3231NB (dated 16/05/2023) allows a maximum daily effluent discharge of 900 m³/d. Details of the permit conditions are summarised in Table 4. Effluent is discharged from the Site at NGR SN 31510 40243 (known as W1) (Figure 2). The effluent is then transferred via a pipe to the discharge point on the receiving water (AT) at NGR SN 31356 40462 (Figure 2).

Effluent quality is monitored at the final effluent sump at NGR SN 31611 40208 (M1) (Figure 2). Flow rates are monitored at NGR SN 31538 40242 (Figure 2).

Table 4. Current Discharge Permit Conditions (permit number EPR/WP3231NB)

Parameter	Emission Limit	Units	Monitoring Frequency	Monitoring Location
Maximum Discharge Volume	900	m ³ /day	Continuous	Flow monitoring location (NGR SN 31538 40242)
Biological oxygen demand (BOD)	20	mg/l	Monthly	SN 31611 40208 (M1)
Chemical oxygen demand (COD)	110	mg/l	Daily	M1
Total suspended solids (TSS)	30	mg/l	Daily	M1
Ammoniacal nitrogen (expressed as N)	10	mg/l	Monthly	M1
Nitrite (expressed as N)	1.0	mg/l	Monthly	M1
Total nitrogen	20	mg/l	Daily	M1
Total phosphorus	1.0	mg/l	Daily	M1
Total aluminium as Al	1.0	mg/l	Weekly	M1
Temperature	21	°C	Continuous	M1
pH	Minimum 6, Maximum 9		Continuous	M1
Mercury and its compounds expressed as mercury (Total Hg)	0.5	µg/L	Annually	M1
Cadmium and its compounds expressed as Cadmium (Total Cd)	0.525	µg/L	Annually	M1
Chloride (Cl-)	No limit set	No limit set	Monthly	M1

Importantly, the DP permit sets annual limits for mercury and cadmium at 50 g each based on mass balance calculation.

4.0 EXISTING DISCHARGE AND PRODUCTION PROCESS

4.1 Dairy Partners Daily Discharge Rates (2018-2023)

The average daily wastewater effluent emissions data from the MCERTS flow meter (2018-2023 periods) were provided by the Dairy Partners Ltd. The values are presented in Table 5.

Table 5. Average daily wastewater emissions from MCERTS flow meter, in cubic meters (via W1 emission point to River Teifi) (Data Sourced: DP HSE Lead John Potter)

Month/Year	2018 (m ³ /d)	2019 (m ³ /d)	2020 (m ³ /d)	2021 (m ³ /d)	2022 (m ³ /d)	2023 (m ³ /d)
Jan	-	682.5	400.4	495.4	520.2	565.4
Feb	-	733.4	No data	423.7	476.1	611.0
Mar	1122.6	685.4	385.7	433.1	536.0	640.3
Apr	834.5	No data	384.0	481.9	601.4	700.1
May	842.6	No data	369.6	590.2	616.3	592.7
Jun	No data	No data	486.7	602.5	529.3	565.5
Jul	707.2	No data	584.4	520.4	562.6	571.6
Aug	854.6	No data	712.5	537.4	574.9	530.5
Sep	864.2	No data	678.4	562.4	578.2	471.3
Oct	708.9	No data	448.7	543.2	606.2	560.18
Nov	696.7	696.8	425.1	527.7	700.6	-
Dec	692.7	665.6	497.9	508.4	609.0	-

Also, Average, MIN and MAX values for Effluent Discharge Rates were calculated and presented in Table 6.

Table 6. Average, MIN and MAX Values for Effluent Discharge Rates.

Year	2018	2019	2020	2021	2022	2023
Unit/Values	(m ³ /d)	(m ³ /d)	(m ³ /d)	(m ³ /d)	(m ³ /d)	(m ³ /d)
AVERAGE Discharge	813.78	692.74	488.49	518.86	575.9	580.85
MIN Discharge	692.7	665.6	369.6	423.7	476.1	471.3
MAX Discharge	1122.6	733.4	712.5	602.5	700.6	700.1

4.2 Increased Cheese Production

The quantity of cheese produced by DP has risen from ca. 8,700 tonnes of mozzarella and ca. 86 million litres of processed milk in 2015, to almost 19,000 tonnes of cheese and approximately 177 million litres of processed milk in 2022 (Table 7) (Info by John Potter, DP HSE lead).

Table 7. Dairy Partners Production Increase Summary (Data Sourced: DP HSE Lead John Potter)

Year	Total Milk Processed (litres)	Total Net Block Production of Cheese (kg)
2015	86,248,223	8,677,424
2016	95,861,863	8,562,405
2017	112,904,226	9,656,000
2018	115,610,872	11,474,603
2019	138,783,250	14,284,617
2020	162,606,416	17,086,784
2021	175,790,923	18,638,911
2022	176,826,086	18,955,702

The average volume of milk treated in 2022 and 2023 using the new effluent treatment plant is approximately 176,000,000 litres; this volume of production resulted in a peak daily volume of treated effluent of approximately 700 m³/d being discharged in the River Teifi.

It can be seen from the tables of volumes of milk treated in preceding years using the old treatment works that the volume of effluent generated per ton of milk treated was much higher.

Dairy Partners have estimated that the current manufacturing facility could treat a maximum 274,000,000 litres (Table 8) per annum if we assume that there is linear relationship between annual volume of milk processed and the daily flow of treated effluent and taking a conservative approach by using the peak daily flow we calculate that the maximum daily flow at the maximum production rate would be 1085 m³/d (if allowed by NRW and accepted through the consequent permit variations).

Table 8. Approximate Maximum DP Site Capacity Data (Data Sourced: DP HSE Lead John Potter)

Year	Total Milk Processed (litres)	Total Net Block Production of Cheese (kg)	Whey Solids (kg)	Sweet Cream (kg)
Potential Future	274,000,000	29,323,000	15,829,000	9,611,000

5.0 FLOW ESTIMATION FOR THE AFON TEIFI AT EXISTING DISCHARGE POINT

In order to assess the potential impact of the effluent discharge, the AT flow rate estimation at the reasonable proximity of discharge point (NGR SN 31356 40462) is required.

Measured flow data is not available at the discharge point. Therefore, the flow data has been based on the Envireau Water Ltd. calculations for consistency and comparability. These are given in (Table 9) below.

Table 9. Low Flow Estimates at Discharge Point

Q (LowFlows2)	Flow (m3/s)	Flow (m3/d)
Q mean	23.3	2,010,000
Q95	2.7	233,000

6.0 RISK ASSESSMENT

6.1 Approach

A risk assessment has been completed following NRW’s technical guidance (Ref. 8).

The NRW’ Improvement programme requirements’ (EPR/WP3231NB, IC17) state that “If the maximum capacity of the installation has increased from the time of the last submitted risk assessment and the current time, the Operator shall review and update the risk assessment to account for the current maximum capacity. The risk assessment shall be submitted to NRW for review. The RA must follow the methodology set out in The Environment Risk Assessment (EPR-H1) to address relevant issues with adequate detail.

6.2 H1 Assessment

A screening test (H1 risk assessment) is required to assess the potential impact of the discharge of mercury and cadmium to the Avon Teifi. Screening tests follow a tiered approach (Screening Test 1-4), with each subsequent test requiring progressively more information (Table 10). Screening Test 1 considers the pollutant concentration in the discharge in relation to the environmental quality standard (EQS). Screening Test 2 evaluates the pollutant dilution in the receiving water.

Table 10. Brief Explanation of the H1 Screening Test for Freshwaters:

Test 1	Check the concentration of the chemical and element in the discharge is > 10% of the EQS (carry out Test2). If <10% not need to collect the data for the subsequent three tests, hazardous chemicals and elements are not a risk to the environment.
Test2	Need the river flow data and daily discharge volume for this test to calculate dilution available in the receiving water. Must check whether the process contribution (PC) of chemical and element is more than 4% of the EQS. PC is the concentration of a discharged chemical and element in the water after it’s been diluted Do the following steps to work out the PC. 1. Multiply the effluent flow rate (EFR) by the release concentration of the pollutant in the effluent (RC). 2. Add your value for the EFR to the river flow rate (RFR). 3. Divide the result of step 1 by the result of step 2. If your value for PC is 4% or less of the EQS, you do not need to carry out tests 3 and 4. If the PC is more than 4% of the EQS you will need to carry out tests 3 and 4
Test3	Not Required
Test4	Not Required

Critical data relevant to the H1 screening tests are presented in Table 11 below.

Table 11. Key Data for Freshwater Screening Tests

Data	Value
Maximum mercury concentration in treated effluent	0.5 µg/L
Maximum cadmium concentration in treated effluent	0.525 µg/L
Permitted maximum effluent flow rate	0.0104 m3/s / 900 m3/d
Calculated Maximum effluents flow rate	0.0125 m3/s / 1085 m3/d
Q95 at the discharge point	2.7 m3/s

6.3 Mercury (Hg) Screening Tests

The maximum mercury concentration (Hg) in the discharge set by the permit is 0.5 µg/L, which is 714 % of the Maximum Allowable Concentration (MAC) EQS of 0.07 µg/L.

As the concentration of Hg exceeds 10% of the EQS, a H1 screening Test 2 was undertaken.

In Test 2, the dilution factors for both the current permitted maximum effluent flow rate and the calculated maximum are required which are 259.6 and 216 respectively. The PC for Mercury was calculated for the permitted maximum discharge at Hg 0.00192 ug/l, representing ca. 2.75% of the MAC-EQS.

For the projected maximum discharge rate at 1085 (m³/d) based on the potential future production figures, the Hg is 0.0023ug/l, representing approximately 3.3 % of the MAC-EQS.

Using a conservative approach by using peak flow rate in Hg testing, the PC of mercury still comes significantly below 4% of the EQS and Screening Test 2 is passed and Test 3 and 4 not required.

Therefore, the potential impact from Hg was screened out, and no further tests were required.

6.4 Cadmium (Cd) Screening Tests

The maximum allowed Cadmium (Cd) concentration in the effluent discharge set by the permit is 0.525µg/L, which is ca. 656% of the Annual Allowable Concentration (AA)-EQS of 0.08 µg/L.

As the concentration of Cd exceeds 10% of the EQS, an H1 screening Test 2 was undertaken.

In Test 2, again the dilution factors for both the current permitted maximum effluent flow rate and the calculated maximum are required which are 259.6 and 216 respectively.

The PC for Cadmium was calculated for the permitted maximum discharge at Cd 0.0020 ug/l, representing ca. 2.52% of the MAC-EQS.

For the projected maximum discharge rate at 1085 (m³/d) based on the potential future production figures, the Cd is 0.0024ug/l, representing approximately 3.0 % of the MAC-EQS.

Using a conservative approach by using peak flow rate in Cd testing, the PC of cadmium still comes significantly below 4% of the EQS and Screening Test 2 is passed and Test 3 and 4 not required.

The potential impact from Cd is screened out, and no further tests are required.

6.5 Sanitary Determinands

For a surface water discharge to be considered acceptable, it must be demonstrated that the discharge will not cause any deterioration in the quality of the receiving waterbody and that the discharge will not prevent the waterbody from meeting its target quality standards (Ref.9).

The AT is designated as a SAC and SSSI, and therefore, consideration must be given to water quality targets. (Ref. 10).

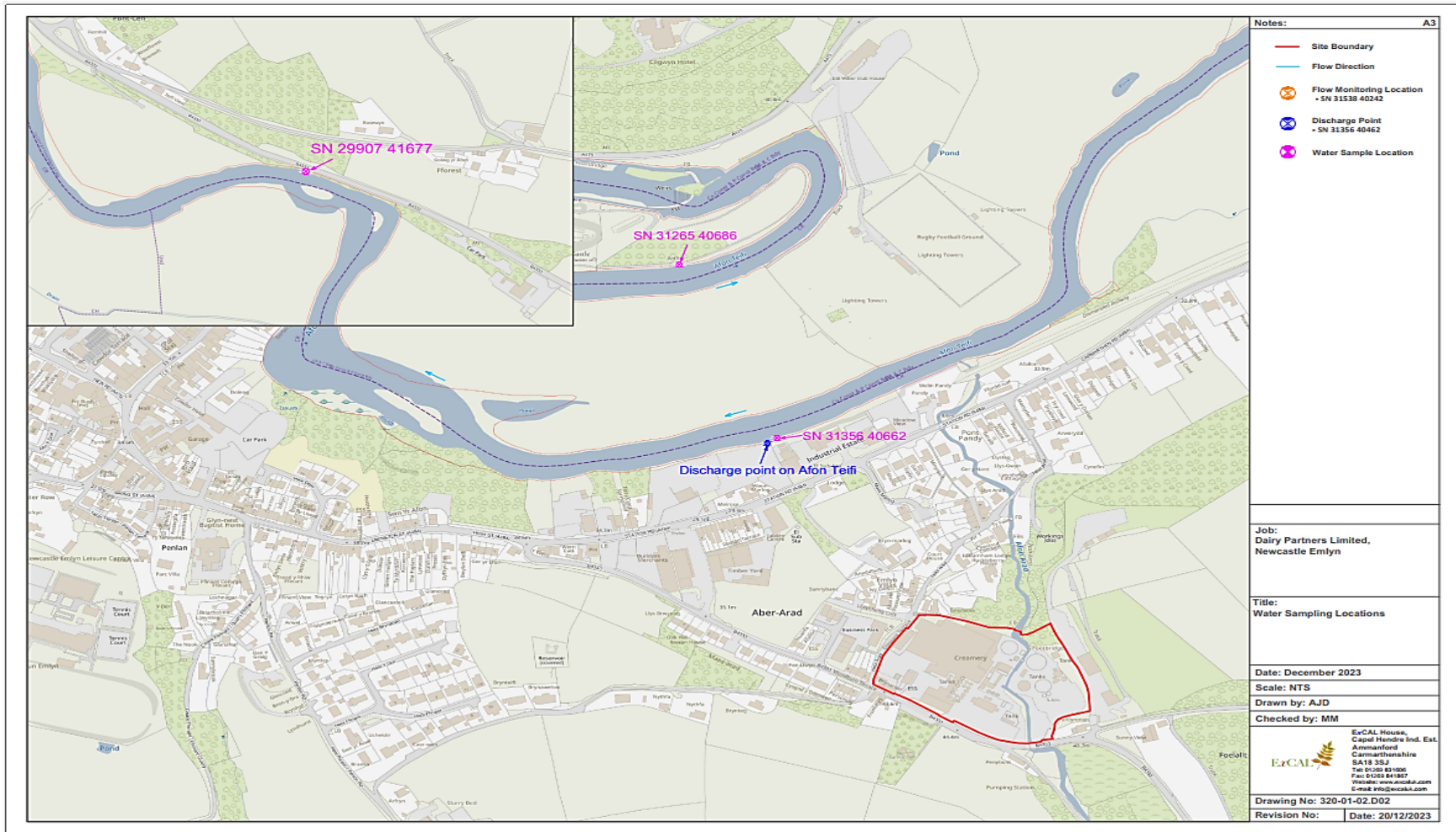
Sampling was carried out with reference to British Standard ISO 5667, in line with the 2020 study. For the consistency and comparability of the results, sampling points were replicated in exact locations and collected over two consecutive days.

A water sample was collected 10m upstream of the existing discharge point (SN 3156 40462) to determine background water quality. A second water sample was collected at SN 30760 40724 to determine water quality downstream of the discharge location. This location was greater than ten river widths downstream of the discharge location to ensure sufficient water mixing below the discharge location. A third water

sample was collected at SN 29904 41448, below the discharge point from the local sewage treatment works. It was selected to assess the water quality associated with the downstream SAC. The water sampling locations are presented in Figure 4.

Water Samples were submitted to a UKAS-accredited laboratory for analysis.

Figure 4. Water Sampling Locations (In Line with the Envireau Ltd Report).



The chemical analysis results are given in Appendix C. The up to date (2023) sanitary determinand values used for tests were collated and presented in Table 12 including the NRW Water Quality Targets for Rivers in SACs 2022 (Ref. 10).

Table 12. Key Data for Sanitary Determinand Tests

Parameter	Upstream	Discharge Point	Downstream Prior to Sewage Treatment Works	Downstream of Sewage Treatment works	Target Water Quality
Receiving water Q95 flow (m3/s)	2.7	2.7	2.7	2.7	n/a
Effluent Discharge Rate (m3/d)	n/a	900	n/a	n/a	n/a
Biological Oxygen Demand (BOD) (mg/L)	<0.4	20	0.7 and <0.4	<0.4	1.5
Un-ionised ammonia (NH ₃ -N) (mg/L) (2020 REPORT)	<0.006	0 – 3.6	<0.006	<0.006	0.025
Ammonia mg/l-1 as NH ₄ (ExCAL 2023)	0.12	10	0.06	0.035	0.2
Phosphate as P (mg/L) (Total phosphorus)	<0.2	1	<0.2	<0.2	0.020
Total suspended solids (mg/L)	9.6	30	5.6	8.2	n/a
pH	7.69	6.0 - 9.0	7.56	7.44	>6.54

The obtained water quality testing results show that the river quality upstream and downstream of the discharge point meets the SAC quality targets for the Afon Teifi.

The detection limits for total Phosphorus are 0.2mg/l which is above the target water quality of 0.02mg/l. But all samples were below this detection limit. The detection limit for orthophosphate is 0.02mg/l and all samples were also below this detection limit.

In order to assess the impact of the effluent discharge on the water quality downstream AT and, therefore, any potential influence on the Afon Teifi SAC, the river quality contribution of individual effluent sanitary determinants must be calculated.

The effluent contribution for each of the sanitary determinants that are discharged by DP into the river Teifi have been calculate for both the permitted maximum flow of 900 m3/d and calculated flow of 1085 m3/d and are given in Table 13 below.

Table 13. Contribution of Sanitary Determinands in the Discharge to the Afon Teifi

Determinand	Release Concentration (Effluent)	Contribution to the AT (Permit maximum flow 900cum/d)	Contribution to the AT (Calculated maximum flow 1085cum/d)	Target SAC River Quality
Biological Oxygen Demand (BOD5) (mg/L)	20	0.07	0.09	1.5
Total ammonia (NH3-N) (mg/L)	10	0.03	0.046	0.2
Un-ionised ammonia (NH3-N) (mg/L) (pH 6 – 9)	0-3.6	0.013	0.016	0.025
Phosphate as P (mg/L)	1	0.004	0.005	0.020
Total suspended solids (mg/L)	30	0.11	0.14	n/a

The contribution of un-ionised ammonia can vary depending upon the pH of the effluent. However, un-ionised ammonia is only present in notable concentrations at a pH close to 9. The operation of the new ETP will rarely reach pH 9 due to the built-in installation of pH control.

Considering the worst-case scenario, which is based on the assessment of the key sanitary determinands (Table 12) at the Q95 river flow rate (dry weather) with a maximum permitted discharge of 900 m³/d and the calculated 1085 m³/d, we can state the following: -

- The discharge will contribute 0.07 mg/L BOD at discharge of 900 m³/d and 0.09 mg/L at 1085 m³/d discharge to the Afon Teifi. The contribution of BOD will not affect the ability to meet the water quality target of 1.5 mg/L in the AT.
- The discharge will contribute 0.03 mg/L total ammonia at discharge of 900 m³/d and 0.046 mg/L at 1085 m³/d discharge to the AT. The contribution of total ammonia will not affect the ability to meet the water quality target of 0.20 mg/L in the AT.
- The effluent will contribute a maximum of 0.013 mg/L of un-ionised ammonia at 900 m³/d discharge and 0.016 mg/L at 1085 m³/d discharge to the AT river. The contribution of un-ionised ammonia will not affect the ability to meet the water quality target of 0.025 mg/L in the AT.
- The discharge will contribute 0.004 mg/L phosphate at maximum 900 m³/d discharge and 0.005 mg/L at 1085 m³/d discharge to the AT. The contribution of phosphate will not affect the ability to meet the AT SAC river EQS of 0.020 mg/L.
- The discharge will contribute 0.11mg/L of suspended solids at maximum 900 m³/d discharge and 0.14 mg/L at 1085 m³/d discharge to the AT. Although there is no set standard, the contribution of TSS should not significantly influence the water quality in the AT.

6.6 Use of Chemicals in DP Production and Treatment Process

DP uses other chemicals in their dairy production and cleaning process.

Aluminium is not mentioned among hazardous or sanitary effluent determinands, but a total aluminium as Al 1.0 mg/L (instantaneous, weekly measured spot sampling) is set within the permit. Based on the ExCAL effluent sampling results, the Al levels range between 37.4 - 62.2 µg/L so below the permitted level.

DP must, therefore, ensure that the use of aluminium-based polyelectrolytes is controlled in such a way as to ensure that the permitted concentration for aluminium is not exceeded and, therefore, that there is no impact on the AT.

7.0 RESULTS SUMMARY

The risk assessment outcomes of the assessed maximum permitted effluent discharge levels (900m³/d) and the calculated maximum flow at (1085 m³/d), at tested concentrations of the priority hazardous substances and other substances, including sanitary substances on the AT river, are presented in Table 14. It can be seen that the effluent analysis given in Appendix C that all the effluent determinands are within the permit concentrations.

Table 14. Summary of the Risk Assessment Results

Determinand	Discharged Effluent Concentration	Does the Discharge Lead to Deterioration in the Receiving Body or Prevent Water Quality Targets from Being Met?
Mercury µg/L	0.5µg/L	No
Cadmium µg/L	0.525 µg/L	No
Biological Oxygen Demand (BOD5) (mg/L)	20mg/L	No
Total ammonia (NH ₃ -N) (mg/L)	10mg/l	No
Un-ionised ammonia (NH ₃ -N) (mg/L) (pH 6 – 9)	0 – 3.6mg/L	No
Phosphate as P (mg/L) (Total phosphorus)	1mg/L	No
Total suspended solids (mg/L)	30mg/L	No

8.0 CONCLUSION

NRW are concerned that the increasing cheese production in the future would cause the maximum permitted daily flow conditions to be exceeded. In line with The Environmental Permitting (England & Wales) Regulations 2016, an increase in the maximum capacity of the installation obligates the 'operator' to revise the risk assessment (RA).

Natural Resources Wales (NRW) issued an 'Improvement Condition' (IC17) concerning the EPR/WP3231NB permit, obliging Dairy Partners (DP) to review the risk assessment.

A risk assessment has been completed in line with the 'improvement condition' which follows NRW guidance. The risk assessment has considered mercury and cadmium which are Priority Hazardous Substances as well as sanitary determinands within the discharge. The use of aluminium in coagulants has also been considered.

The completion of a two tier H1 risk assessment screened out any impact from both mercury and cadmium.

An assessment of the sanitary determinands BOD, total ammonia, unionised ammonia, phosphate and suspended solids demonstrated that the discharge at the maximum production flow rate of 1085cum/d would not lead to a deterioration in the water quality in the Afon Teifi or prevent water quality targets being met in the Afon Teifi SAC/SSSI.

9.0 REFERENCES

REFERENCE 1: Afon Teifi/ River Teifi, Designated Special Area of Conservation (SAC) (<https://sac.jncc.gov.uk/site/UK0012670>) [Accessed 11/12/2023].

REFERENCE 2: The Teifi and North Ceredigion Management Catchment https://naturalresources.wales/media/679392/2016-updated-teifi_catchment_summary_nrw.pdf [Accessed 16/12/2023].

REFERENCE 3: Afon/River Teifi SAC Management Plan <https://naturalresources.wales/media/670702/Afon%20Teifi%20%20River%20Teifi%20Management%20Plan.pdf> [Accessed 16/12/2023].

REFERENCE 4: Compliance Assessment of Welsh River SACs against Phosphorus Targets <https://cdn.cyfoethnaturiol.cymru/media/693025/compliance-assessment-of-welsh-sacs-against-phosphorus-targets-final-v10.pdf?mode=pad&rnd=132557227301870000> [Accessed: 10/12/2023].

REFERENCE 5: Phosphorus Source Apportionment Summary: UPDATING THE SAGIS AFON TEIFI MODEL [file:///C:/Users/Loaner/Downloads/Updating%20the%20SAGIS%20Afon%20Teifi%20Model%202023%20-%20Final%20English%20\(2\).pdf](file:///C:/Users/Loaner/Downloads/Updating%20the%20SAGIS%20Afon%20Teifi%20Model%202023%20-%20Final%20English%20(2).pdf) [Accessed: 14/12/2023].

REFERENCE 6: Freshwater Priority Hazardous Substances EQS (<https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit>) [Accessed 14/12/2023].

REFERENCE 7: Updated NRW Water Quality Targets for SAC Rivers (Afon Teifi) (<https://naturalresources.wales/evidence-and-data/research-and-reports/water-reports/updated-water-quality-targets-for-welsh-river-sacs-2022/?lang=en>) [Accessed 14/12/2023].

REFERENCE 8: Surface water pollution risk assessment for your environmental permit <https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit> [Accessed 14/12/2023].

REFERENCE 9: H1 Annex D2 Assessment of Sanitary and Other Pollutants within Surface Water Discharges https://assets.publishing.service.gov.uk/media/5a7f8586e5274a2e87db65a3/H1_annex_D2.pdf [Accessed 14/12/2023].

REFERENCE 10: Water quality SAC Targets table by NRW) <https://naturalresources.wales/evidence-and-data/research-and-reports/water-reports/updated-water-quality-targets-for-welsh-river-sacs-2022/?lang=en> [Accessed 17/12/2023].

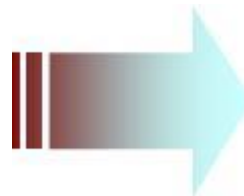
APPENDIX A

The Design Process Report

Order Confirmation

Dairy Partners (Cymru) United Kingdom

Order number	P19724
Project description	Filter/DAF/FBR biological treatment
Date	26-11-2019



AFFORDABLE CLEAN WATER

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1. PROCESS DESIGN

1.1. Design parameters¹

Waste water source	
Type of industry	Dairy plant, mainly producing mozzarella
Operation	28 hours cheese production followed by 4 - 10 hours CIP cleaning
Daily flow	800 m ³ /day
Flow CIP cleaning	up to 585 m ³ in 4 - 10 hours (up to 65% of daily flow)
Plant design flow	900 m ³ /day
Peak flow during CIP cleaning	100 m ³ /hr

Waste water data		Min.	Max.	Average
TSS	mg/l	325	1780	857
FOG	mg/l	< 10	< 10	< 10
Total Nitrogen	mg/l	3.2	107	42
Ammonia	mg/l	4.1	72.4	32.3
Total Phosphorus	mg/l	10.4	28.1	19.4
Mercury	µg/l	1.9	7.1	5.3
Cadmium	µg/l	< 0.080	1.3	0.75

The design data for COD, pH, Turbidity, Salt and Temperature data are based on the analyses of January 2019 up to August 2019, which we received in the file "Effluent Results 2019".

The design data stated above are based on analyses executed by Decus Research Limited, Certificate of Analysis Numbers 3436 and 3437.

The file "Effluent Results 2019" and the Certificates of Analysis are included as Appendix A to this Order Confirmation.

The data in the file "Effluent Results 2019" show occasional pH levels of 9 and higher, while normally pH levels are low. Because of these variations, 2-way pH correction by either caustic soda or sulphuric acid is included.

1.2. Design parameters biological treatment system

Design data	
Type of biological treatment system	FBR (Flotation Bio Reactor), continuous aerobic system
Design COD	2,000 mg/l, 1,800 kg/day
Design Nitrogen	35 mg/l, 31.5 kg/day
Design Phosphorus	2 mg/l, 1.8 kg/day
F/M ratio	0.2 kg COD/kg MLSS.d
MLSS	6.2 kg/m ³

¹ The stated design data in paragraph 1.1 are based on your information and form the basis of our design. Corrections could result in technical and/or commercial modifications.

1.3. Target treated water quality¹

Parameter		
BOD ₅	mg/l	≤ 20
TSS	mg/l	≤ 30
Ammonia as N	mg/l	≤ 10
Nitrite as N	mg/l	≤ 1
Phosphate as P	mg/l	≤ 1
Aluminium	mg/l	≤ 1
Mercury	µg/l	≤ 0.5
Cadmium	mg/l	≤ 0.01



We confirm we will meet the target discharge limits, apart from the Mercury. The latest analyses showed Mercury levels in the crude of over 7 µg, which is totally unexpected. We expect to get very close to the Mercury limit, but we cannot give a hard guarantee on this. Should this figure not be met then dosing some activated carbon may be needed or a carbon filter on the outlet.

1.4. Expected utility consumptions & sludge production²

Sludge production	Quantity	
Decanted DAF + biological sludge	22 - 25 m ³ /day	9 - 10% DS
Chemical consumption - pre-treatment		
Coagulant (PAC)	300 - 350 l/day	@ 9% Al
Neutraliser (NaOH)	500 - 600 l/day	@ 32%
Neutraliser (H ₂ SO ₄)	³	@ 37%
Flocculant (anionic emulsion polymer)	8 - 10 l/day	@ 40% active
Chemical consumption - bio treatment		
Phosphoric acid	approx. 15 l/day	@ 70%
Urea	approx. 45 l/day	@ 40%
Flocculant (cationic emulsion polymer)	20 - 25 l/day	@ 40% active
Tap water (for poly make-up)		
Capacity 2,000 l/hr @ 2 - 3 bar	11-12 m ³ /day	
Compressed air		
According ISO 8573-1:2010 - 7:4:4	140 NI/min	@ 7 barg
Electricity		
Installed power	~175 kW	
Consumed power	~1,750 kWh/day	
Main power supply	400 V, 50 Hz, 3 ph + "0" + PE	
Control voltage panel	240 V AC	
Control voltage field components	24 V AC	

¹ Refer to Performance Testing Protocol.

² The expected figures are indications based on a flow of 800 m³/day, the influent data, the executed jar tests and experience from similar plants.

³ Occasionally pH levels are high. Then dosing of sulphuric acid (H₂SO₄) instead of caustic soda (NaOH) will be required. Daily consumption will be similar or lower.

2. Scope of supply

2.1. Pre-treatment

The waste water from Dairy Partners will be screened by an existing mesh filter and will be collected in a pump pit. From this pump pit it will be fed to the new balance tank by existing pumps. **In the balance tank 2-way pH correction is foreseen.**

From the balance tank the water will be pumped to the coagulation/flocculation/flotation system. In the pipe flocculator, a coagulant, a neutraliser and a flocculant will be dosed for coagulation and flocculation of the suspended and emulsified pollution. The flocks which are formed are separated by a DAF unit. The sludge which is generated by the DAF unit will be pumped into the sludge tanks. The Redox DAF unit will be equipped with an automatic micro bubble diffuser cleaning system and is therefore clog-free. The DAF unit will be equipped with a cover, operated by gas springs.

The treated water after the DAF system will be fed to the biological treatment system. A transfer tank and transfer pumps are included in the scope of supply.

Following equipment is included in our scope of supply:

Item	Capacity/dimension	Quantity
Mixer/aerator for balance tank (with special coating)		2
Lifting davit for mixer/aerators in balance tank		2
Level controller for balance tank		1
pH measurement and control balance tank		1
Dosing unit for neutraliser (NaOH)	75 l/hr	1
Dosing unit for neutraliser (H ₂ SO ₄)	75 l/hr	1
Storage tank for sulphuric acid (H ₂ SO ₄) 37%	1.2 m ³	1
• Safety bund		1
• Level controller		1
• Overfill protection		1
• Cat and mouse type content gauge		1
Feed pump DAF system (SS316) with VSD	50 m ³ /hr each	2 (1 duty, 1 stand-by)
Flow meter		1
Pneumatic and manual valves for feed pumps (Orbinox, gate valves)		1 set
Flocculator RPF 060	50 m ³ /hr	1
Coagulant dosing unit	115 l/hr	1
Neutraliser dosing unit	75 l/hr	1
Safety cabinet for dosing units (2 pumps per cabinet)		2
pH measurement and control		1
SmartDose™ for optimisation of coagulant dosing rate (see note in section 3.1)		1
Flocculant dosing unit	100-500 l/hr	1
Flocculant make-up unit Liquidox AP1000	1000 l/hr	1
DAF unit WWL50 (SS316 for wetted parts)	50 m ³ /hr	1
• Recirculation pump (SS316)	15 m ³ /hr @ 6 bar	1
• Automatic micro bubble diffuser cleaning system		1
• Scraper with VSD		1
• Sediment auger + drain valve (Tyco, butterfly valve)		1
• Cover for DAF unit (SS316)		1
• L-shape platform (galvanised steel)		1

Sludge pump (SS316 wetted parts)	5 m ³ /hr	1
Pneumatic and manual valves for sludge pump (Orbinox, gate valves)		1 set
Level controller for sludge compartment		1
Transfer tank	2 m ³	1
Transfer pump primary DAF effluent to selector (SS316)	50 m ³ /hr each	2 (1 duty, 1 stand-by)
Level controller for transfer tank		1
Pneumatic and manual valves for transfer pumps (Tyco, butterfly valves)		1 set



WWL series DAF unit - top view



Pipe flocculator RPF



Safety cabinet



Diffuser cleaning system



Bottom auger + air diffusers

2.2. FBR (Flotation Bio Reactor) biological treatment

In the biological treatment system the pollution is decomposed by aerobic biological bacteria that live in flock-like colonies, called activated sludge.

The effluent from the DAF is fed into a selector which will be erected inside the aeration tank. In the feed line to the selector, the turbidity of the water will be monitored. In case a pre-set level is exceeded, an alarm will be generated.

In the selector the water is mixed with a set amount of activated sludge. In the selector tank the proper conditions exist for the activated sludge to absorb most of the dissolved pollution, which prevents excessive concentrations of filamentous bacteria to be formed. Phosphoric acid and urea will be dosed into the selector in order to obtain a correct nutrient balance.

From the selector tank the water flows into the aeration tank. In the aeration tank the activated sludge bacteria utilise oxygen to decompose pollution into mainly carbon dioxide and water. The required oxygen is supplied by a bottom aeration system fed by blowers. The aeration grids can be lifted out for maintenance purposes.

The separation of treated water and biomass is done by a second DAF unit. In the feed line to this DAF unit polymer will be dosed to enhance the separation of the activated sludge. Most of the activated sludge will be returned to the selector tank and aeration tank. A part of the sludge will be directed to the sludge tank as waste activated sludge, based on MLSS measurement in the aeration tank. The treated water will be discharged from the DAF to the sewer. The DAF unit will be equipped with a cover, operated by gas springs.

The effluent quality of the DAF will be monitored continuously. In case either the pre-set COD, TSS or ammonia level is exceeded, the water will be led to a transfer tank, from where it will be pumped into the out of spec tank. The present 250 m³ and 150 m³ tanks with mixers will be used for this purpose. The piping, valves, return pump etc for the divert system will be supplied by Ritetrack.

Advantages of the **FBR** system compared to conventional systems

- Able to retain higher activated sludge concentrations : smaller aeration basins compared to conventional clarifier or SBR systems (up to 50% reduction of the size).
- No denitrification problems : Nitrogen gas formation during activated sludge separation will aid the separation process, contrary to clarifier or SBR systems that usually stop working under such conditions
- Almost insensitive to filamentous bacteria : **FBR** will continue to generate a clear effluent at filamentous bacteria levels where conventional clarifier or SBR systems cannot.
- Relatively dry sludge : The activated sludge is separated as a far more concentrated liquid than is possible in conventional clarifier or SBR systems, resulting in a 4 to 6 times lower sludge volume.
- Cleaner effluent : The suspended solids concentration in the effluent is low.

Following equipment is included in our scope of supply:

Item	Capacity/dimension	Quantity
Turbidity sensor in feed line to selector		1
Dosing unit for phosphoric acid	6 l/hr	1
Dosing unit for urea	6 l/hr	1
Safety cabinet for dosing units (2 pumps per cabinet)		1
Storage tank for phosphoric acid 70-75%	1.2 m ³	1
• Safety bund		1
• Level controller		1
• Overfill protection		1
• Cat and mouse type content gauge		1
Storage tank for urea 40%	1.2 m ³	1
• Safety bund		1
• Level controller		1
• Overfill protection		1
• Cat and mouse type content gauge		1
Liftable aeration grids with membrane tube diffusers		1 set
Compressor blower with noise insulating casing and VSD	940 m ³ /hr each	2 (1 duty, 1 assist)
Oxygen measurement and control		1
Temperature sensor for blowers		1
MLSS measurement and control		1
Mixer for aeration tank (with special coating)		1
Lifting davit for mixer in aeration tank		1
Level controller aeration tank		1
Feed pump to activated sludge DAF (SS316) with VSD	50 m ³ /hr	2 (1 duty, 1 stand-by)
Pneumatic and manual valves for DAF feed pumps (Tyco, butterfly valves)		1 set
Flow meter		1
Flocculator FP045	50 m ³ /hr	1
Flocculant dosing unit	300-1,300 l/hr	1
Flocculant make-up unit Liquidox AP1000	1,000 l/hr	1
DAF unit WWL100 (SS316 wetted parts)	50 m ³ /hr	1
• Recirculation pump (SS316)	50 m ³ /hr @ 6 bar	1
• Automatic micro bubble diffuser cleaning system		1
• Scraper with VSD		1
• Sediment auger + drain valve (Tyco, butterfly valve)		1
• Cover for DAF unit (SS316)		1
• L-shape platform (galvanised steel)		1
Return activated sludge pump (SS316 wetted parts)	16 m ³ /hr	1
Waste activated sludge pump (SS316 wetted parts)	2.5 m ³ /hr	1
Pneumatic and manual valves for sludge pumps (Tyco, butterfly valves)		1 set
Level controller for sludge compartment		1
Effluent quality sensor (COD, TSS and N-NH ₄)		1
Automatic divert valves for out of spec effluent (Tyco, butterfly valves)		1 set

Transfer tank for out of spec effluent	2 m ³	1
Transfer pump for out of spec effluent (SS316)	40 m ³ /hr	1
Level controller for transfer tank		1
Pneumatic and manual valves for transfer pump (Tyco, butterfly valves)		1 set
Effluent flow meter		1



Liftable aeration grid



Liftable aeration grids installed



Aeration grids during start-up



Blower



DAF unit with covers

Signed by Redox:.....

Signed for approval by Dairy Partners:.....

2.3. Installation work on site and tanks

The equipment will be installed on site, in the area where the present effluent treatment plant is located and the available space next to it.

The sludge from the first DAF unit and the waste activated sludge (part of sludge from second DAF) will be collected in sludge tanks with decant valves. In these tanks it will be allowed to dewater by gravity. This will result in a water layer which can be decanted, leaving a lower volume of sludge for disposal.

Following equipment and services are included in our scope of supply:

Item	Quantity
Offload, position and install the equipment	1
Sludge storage and decant tank, 30 m ³	2
• Level controller and overflow protection	2 (1 for each tank)
• Cat and mouse level gauge	2 (1 for each tank)
• Decant tree with 4 manual operated decant valves	2 (1 for each tank)
• Bauer coupling for road tanker (6" male)	2 (1 for each tank)
Balance tank 911 m ³ , 12.808 m dia x 7.071 m high (stainless steel)	1
• GRP roof with 2 hinged hatches	1
• Viewing platform 2 x 1 m c/w hooped safety access ladder (galv. steel)	2
• Dia 800 mm hinged tank wall access manway (stainless steel)	1
• Flanges, including 2x spare	1 set
Aeration tank 1,599 m ³ , 16.224 m dia x 7.73 m high (stainless steel)	1
• Viewing platform 2 x 1 m c/w hooped safety access ladder (galv. steel)	2
• Dia 800 mm hinged tank wall access manway (stainless steel)	1
• Flanges, including 2x spare	1 set
Interconnecting wiring between control panel and equipment	1
• Local isolators where required	1 set
• Tray work and bracketing (galvanised steel)	1 set
Interconnecting piping (PVC, except for flexible hose dosing lines)	1 set
• Piping supports	1 set
• Flanges and gaskets	1 set
Blower piping (SS)	1 set



Typical site installation

2.4. E-panel and interface

Central control panel, according NEN-EN-IEC 60204-1 and NEN-EN-IEC 61439, with all necessary components to control the equipment supplied by REDOX. Panel suited for placing in a separate, dust free room with constant humidity (rel. humidity < 80% and non-condensing) and temperatures between 10 - 28°C. No chemical / flammable / aggressive / corrosive gases to be present which may cause damage to the control panel.

The electrical control panel is equipped with a Siemens S7-1500 series PLC including 12" Full color HMI to control, adjust and monitor the complete process in the most user-friendly way. Including eWon modem with GSM functionality, for remote support and which can send an SMS text message for each alarm.

The HMI can be taken over remotely via a device running VNC connected to the PLC network e.g. a mobile phone, tablet or PC. This equipment should be supplied by the client, as well as a local network.

The waste water treatment system can be integrated by Dairy Partners into your site Scada system. Our Profinet devices such as PLC and HMI should then be integrated into your network. To assist with the integration, Redox Water Technology will supply:

- Data exchange list (MS-Excel format) with the addresses in the PLC
- Examples of the Scada screens, based on our HMI screen
- Guidance for the integration

Following equipment and services are included in our scope of supply:

Item	Quantity
Central electrical control panel	1
• Siemens S7-1500 series PLC	1
• Siemens 12" touch panel	1
• Remote access via ethernet	1

The panel will control following equipment which is not in our scope of supply:

- Sludge transfer pump from sludge tanks to road tanker, xx kW, fixed speed (to be confirmed)
- Transfer pump from calamity tanks to aeration tank and balance tank, xx kW, fixed speed, including level sensors and valves (to be confirmed)
- Effluent transfer pumps, xx kW, fixed speed, including level sensors and valves (to be confirmed)

The panel will also control the present chemical bulk tanks for coagulant and neutraliser, based on following signals:

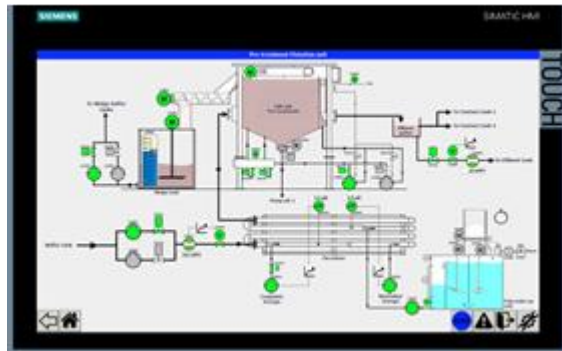
- Level sensor (4-20 mA)
- High level alarm (digital contact)
- Leakage sensor (digital contact)

The anticipated length of the control panel is 3.6 metres (3 cabinets of 1.2 metres each). Space should be allowed for a 4th cabinet of 1.2 metres length for a possible future sludge dewatering system. The panel will be prepared for addition of this 4th panel (e.g. main switch and main distribution will be sized for future situation).

Other dimensions of the panel are 500 mm internal depth and 2200 mm height (including plinth, excluding lifting eyes).



Control panel with touch panel



Typical screen shot HMI

2.5. General scope and services

Following equipment and services are included in our scope of supply:

Item
Transport DAP Newcastle Emlyn, UK
RA/MS
Engineering
Project management
FAT & SAT
Start-up and commissioning
Operator training
Operation & maintenance manuals, documents, drawings

2.6. Civil works

The selector tank and the required concrete bases for the tanks are included in our scope of supply.
The civil works include:

Item	Quantity
Reinforced concrete base for balance tank	1
Reinforced concrete base for aeration tank	1
Selector tank constructed from precast rings, 2 m dia inside aeration tank (22 m ³)	1

Design of bases is based on the plate loading tests executed by Quantum Geotechnic on 6th November 2019 and following drill sheets which we received from Dairy Partners:

- (1) Sat 07 09 19 BH 1.xlsx
- (1) Sat 07 09 19 BH 2.xlsx
- (1) Sat 07 09 19 BH 3.xlsx

These are included as Appendix B.

3. Commercial details

3.1. Project price

3.2. Delivery time

The time scale of the project is to be agreed upon.

After the equipment has been reported ready for shipment customer is welcome to check the equipment in Redox Water Technology's premises.

3.3. Payment terms

3.4. Assumptions & exclusions

Assumptions:

We have assumed that:

- The area is clear, level and is available for installation
- Installation can take place Mon-Fri during normal working hours (08:00 to 17:00) in one continuous period
- There is a secure storage area for materials
- Any required permits or permissions are made available to work in a timely manner
- On site parking is available for our (road) transport vehicles

Exclusions:

The following is excluded from our scope of supply unless specifically stated in this document:

- Civil works, e.g. concrete bases for equipment (except for works mentioned in section 2.6 of this quotation)
- Equipment building
- Any welfare or site security
- Any waste disposal during construction
- Any modifications to existing pumping sumps, tanks, building, equipment etc
- Piping and valves for diversion of off-spec water to calamity tanks
- Pumps, piping and valves for return of off-spec water to the balance tank or aeration tank
- CDM
- Potable water supply and connections
- Supply of compressed air
- Storage tanks for concentrated emulsion polymer (cans will be used)
- Main power supply to the electrical control panel
- Ethernet cable to electrical control panel
- Any insulation and trace heating
- Demolition of redundant equipment, tanks and other items
- Inoculation sludge for the aerobic biological treatment system
- Filter system and transfer pumps to CIP water tank / balance tank (existing)
- 250 m³ and 150 m³ tanks with mixers which will act as out of spec tanks (existing tanks will be reused)
- Costs for laboratory analyses during commissioning and performance testing
- Spare parts
- All taxes such as but not limited to VAT and import duties
- Any items and works not specifically mentioned in this proposal are excluded

3.5. Notes & Conditions concerning tanks and civil works

- a) The site should be clear and level, with good access to it and round it, and that we are not subject to workplace stoppages outside of our control.
- b) The tank will be designed for a specific gravity of 1.05 and will be suitable to store liquid with a pH range between 2 and 11 with a controlled Ambient operating temperature.
- c) External colour of the tanks shall be self-coloured
- d) Access to the top of the tanks will be provided via a ladder leading to a dedicated 1,000mm x 2,000mm platform which will be situated 1,100mm below the top of the tank. The Access Steelwork we have offered would be designed and fabricated to BS5395. All materials unless otherwise stated would be Galvanised Mild Steel. All Galvanising would be to BS EN ISO 1461:2009. Platform shall be suitable for Davit & personnel access to remove mixing equipment from tank.
- e) We have included for the construction of a reinforced concrete base for the tanks. The concrete base will be designed as a water retaining structure in accordance with BS8007 and BS8110. We have included the supply and installation of 300mm compacted stone under each base and a 75mm thick concrete blinding layer.
We have excluded all excavation & de-watering (if required) in relation to the concrete base is by others to a suitable level. With ground bearing conditions being 140KN/m² minimum.
- f) In order to provide a safe working environment for our installation team we would ask that the ground immediately surrounding the tank base slab must be no more than 250mm below the top of the tank base. This ground must be suitable to withstand repeated heavy foot traffic without turning to mud and be free from any excavations during the tank build.
- g) We have assumed welfare facilities will be provided on site FOC.
- h) We have assumed unhindered access in and around the site for the full duration of our works on site for all plant and personnel required for the installation.
- i) Due the current condition of the existing stream wall, we cannot be held responsible for any deterioration caused by the movement of heavy plant on site.
- j) Any spoil / arisings / waste / packaging materials will be moved to an agreed location on site (not exceeding 100m). Should off-site removal be required, then additional costs will apply.
- k) We have included for the closing of any tank manways in preparation for hydrostatic testing, however the supply of the water and the filling of the tanks, is to be by others.

3.6. General terms and conditions

All tenders and contracts for the performance of deliveries by us outside the Netherlands are governed by the ORGALIME General Conditions for the supply and erection of mechanical, electrical and electronic products (ORGALIME SI 14) of January 2014.

3.7. Delivery terms

Delivery will be governed by the Incoterms 2010 (English version).

3.8. Guarantee

Redox Water Technology B.V. guarantees that the supplied equipment complies with the provisions of the contract and any deviations agreed upon in writing by both parties.

During the guarantee period Redox Water Technology will send replacement parts for any defective parts of the equipment that was part of the original Redox Water Technology supply as long as the proper operation and maintenance procedures have been observed as described in the operation and maintenance manual. Exceeding the capacity limit of the equipment or bypassing safety devices or -safety provisions will immediately forfeit all future guarantee claims.

Guarantee period lasts maximum of 2 years.

The guarantee period will start after either the protocol of acceptance is signed for approval by the customer or the customer starts operating the equipment or 180 days after the date that the equipment was reported ready for shipment, whichever date comes first.

3.9. Disclaimer

Redox Water Technology B.V. reserves the right to apply different equipment brands when that particular supplier changes its name, alters the specs- or, stops manufacturing the respective equipment. Should the necessity arise Redox Water Technology will strive to apply an alternative of equal or better quality than the equipment that is mentioned in this document. Redox Water Technology B.V. reserves the right to change the scope and/or implement technical modifications to the equipment and/or systems with the intention to improve the functioning of said system and/or equipment at any time after the contract has come into effect. Pictures, sketches and drawings in this document are for reference purposes only. Actual delivery may deviate from the items-process shown.

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In the event of Brexit, if either Party considers that the consequences of Brexit materially increase the costs of it performing its obligations under this Agreement and/or reduces its income under this Agreement and/or otherwise adversely affects the benefit it derives from this Agreement, such Party may give notice to the other of the same, and shall promptly supply such details and evidence of such consequences as may reasonably be required by the other Party). Within fourteen (14) days of the other Party receiving such notice, the Parties shall discuss in good faith and agree whether any amendments are required to this Agreement as a result of Brexit, such that the provisions of this Agreement maintain the same overall balance of obligations, benefits, liabilities and risk between the Parties as applied at the date of this Agreement. The Parties agree that the imposition of tariffs and other trade barriers relating to the subject matter of this Agreement and not in existence at the date of the Agreement shall be considered a change in the overall balance.

3.11. Validity

This **order confirmation** is not valid in case Orgalime conditions are not included or do not accompany this quotation. In all other cases the quotation expires 30 days after the date the document was submitted. In case this document is translated, the English version will remain the only legal binding version.



Dairy Partners (Cymru), UK

Our ref. : P19724
Date : 26-11-2019

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Date 26-11-2019

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Signed by:.....
Position in company:.....

- Appendix A Design data
- Appendix B Plate loading tests and drill sheets
- Appendix C Orgalime SI14 delivery conditions

**APPENDIX B
EXISTING TREATED EFFLUENT WATER QUALITY DATA**

APPENDIX B

Flow and Determinand Concentrations (New Permit application)

RISK ASSESSMENT FOR A DAIRY EFFLUENT SURFACE WATER DISCHARGE

NEWCASTLE ELMYN, CARMARTHENSHIRE, SA38 9DQ

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Revision	Details	Completed by	Date	Checked by	Date
REV01	1 st Draft	ER	22/10/2020	JD	27/10/2020
REV02	Final Draft	JD	29/10/2020	Client	29/10/2020

SURFACE WATER RISK ASSESSMENT: DAIRY EFFLUENT SURFACE WATER DISCHARGE

NEWCASTLE ELMYN, CARMARTHENSHIRE

Non-Technical Summary

Dairy Partners have requested a variation to their permit (EPR/WP3231NB) to discharge into the Afon Teifi at their cheese making site in Newcastle Emlyn, Carmarthenshire, SA38 9DQ, in order to allow a new effluent treatment plant, which replaces their existing effluent treatment plant, to be used. The proposed discharge limits are less than those in the existing permit.

Dairy Partners have invested in and constructed a new effluent treatment plant to provide a robust treatment process which will continue to factory in the future.

Dairy Partners have submitted an application to vary their existing discharge permit and as part of the variation process NRW intend to review the complete discharge permit as the permit hasn't been reviewed recently. NRW have therefore requested that a risk assessment is undertaken to consider the impact of the proposed discharge on the Afon Teifi. NRW have requested that the risk assessment be completed before validating the application.

This report provides the background, risk assessment process, results and conclusions

A risk assessment has been completed to support the variation application which follows NRW guidance.

The risk assessment has considered mercury and cadmium which are Priority Hazardous Substances as well as sanitary determinands. The use of aluminium in coagulants has also been considered.

The completion of a two tier H1 risk assessment has screened out any impact from both mercury and cadmium.

The assessment of the sanitary determinands BOD, total ammonia, un-ionised ammonia, phosphate and suspended solids, demonstrates that the discharge will not lead to a deterioration in the water quality in the Afon Teifi or prevent water quality targets being met in the Afon Teifi SAC/SSSI.

Permitting the proposed discharge will not affect or lead to a deterioration in the WFD status of the Afon Teifi or impact on the SAC/SSSI, and due to the proposed lower discharge limits will contribute to betterment.

Envireau Water
29/10/2020

RISK ASSESSMENT FOR A DAIRY EFFLUENT SURFACE WATER DISCHARGE

NEWCASTLE ELMYN, CARMARTHENSHIRE, SA38 9DQ

1 INTRODUCTION

Envireau Water has been commissioned by Dairy Partners Ltd (Dairy Partners) to complete a surface water risk to support them in their application for a variation to their current discharge permit (EPR/WP3231NB). The existing discharge permit enables Dairy Partners to discharge cheese making effluent from an existing effluent treatment plant, (ETP) at their site in Newcastle Emllyn (the 'Site'), Carmarthenshire, SA38 9DQ, to the Afon Teifi (Figure 1).

Dairy Partners existing effluent treatment plant (ETP) is aged and is considered not to be capable of providing a reliable long-term treatment option. As such Dairy Partners have invested in and constructed a new ETP to provide a robust treatment process. Dairy Partners have submitted an application to vary their existing discharge permit to Natural Resources Wales (NRW), in order to permit the new ETP. As part of the variation process NRW intend to review the complete discharge permit as the permit hasn't been reviewed recently. NRW have therefore requested that a risk assessment is undertaken to consider the impact of the discharge on the Afon Teifi. NRW have requested that the risk assessment be completed before validating the application.

This report provides the background, risk assessment process, results and conclusions.

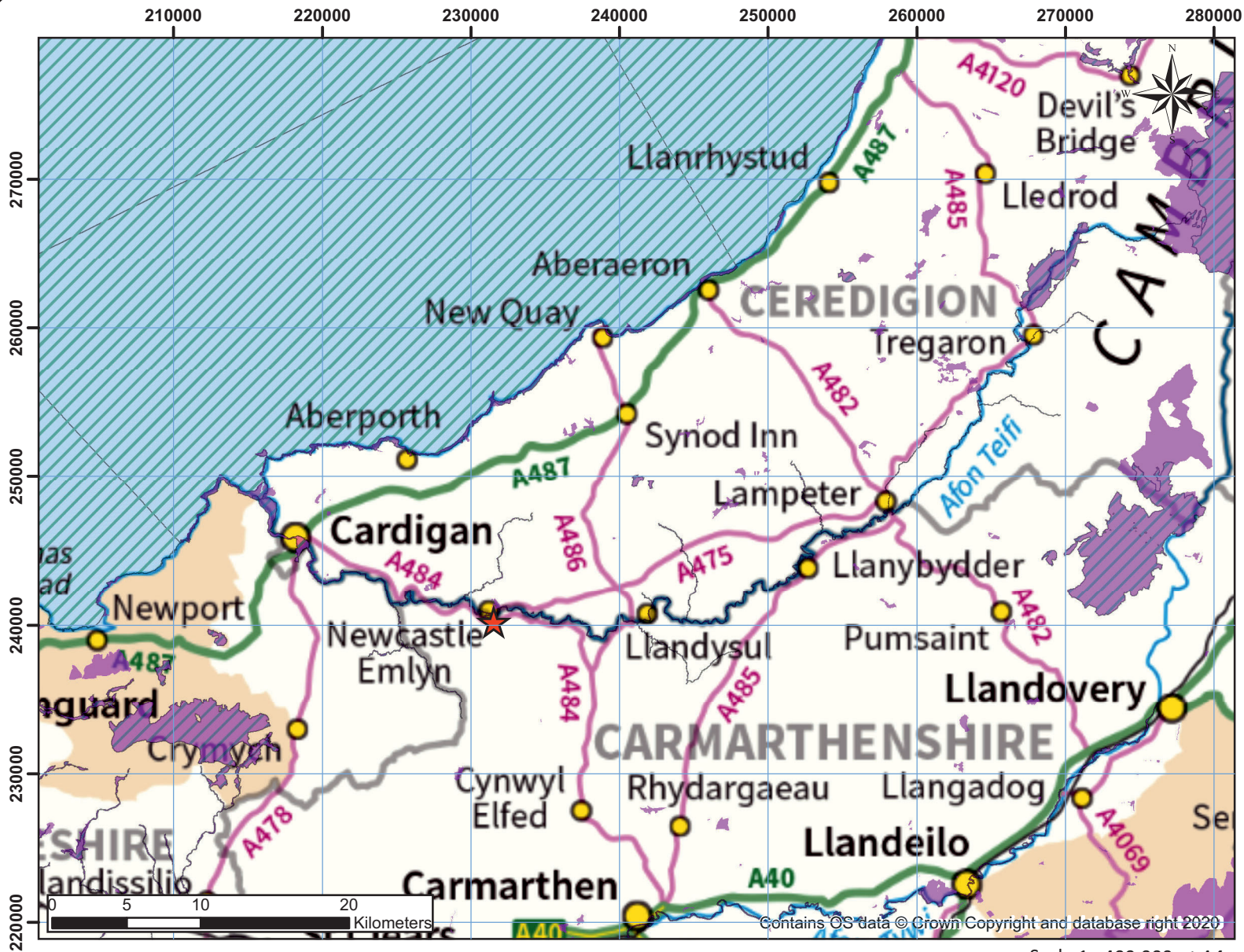
2 SITE SETTING

The Site is located in Newcastle Emllyn off the B4333. The Afon Arad, a tributary of the River Teifi, runs along the eastern boundary of the Site in a northerly direction. The Site is ca. 270m south of the River Teifi. A plan showing the Site is presented on Figure 2.




2.1 Receiving Water Body -Afon Teifi

The Afon Teifi is one of the longest rivers in South West Wales at 122km. Its source is Llyn Teifi in the Cambrian Mountains. In its upper course the major land use is moorland and forestry. In the middle reaches dairy and livestock rearing becomes more dominate. In the lower catchment dairy industries are significant. The Afon Teifi supports salmon and sea trout fisheries of national importance [Ref. 1].

The Water Framework Directive (WFD) status of the Afon Teifi at the Site is GOOD, both in terms of its ecological condition and its chemical status [Ref. 2]. Despite this it should be acknowledged that downstream of the Site where the Afon Ceri confluences with the Teifi the WFD status drops to MODERATE. It is noted that the water quality in some reaches of the Afon Teifi are impacted by abandoned metal mines which result in legacy pollution of the watercourse.



KEY

-  Site Location
-  Special Area of Conservation
-  Site of Special Scientific Interest

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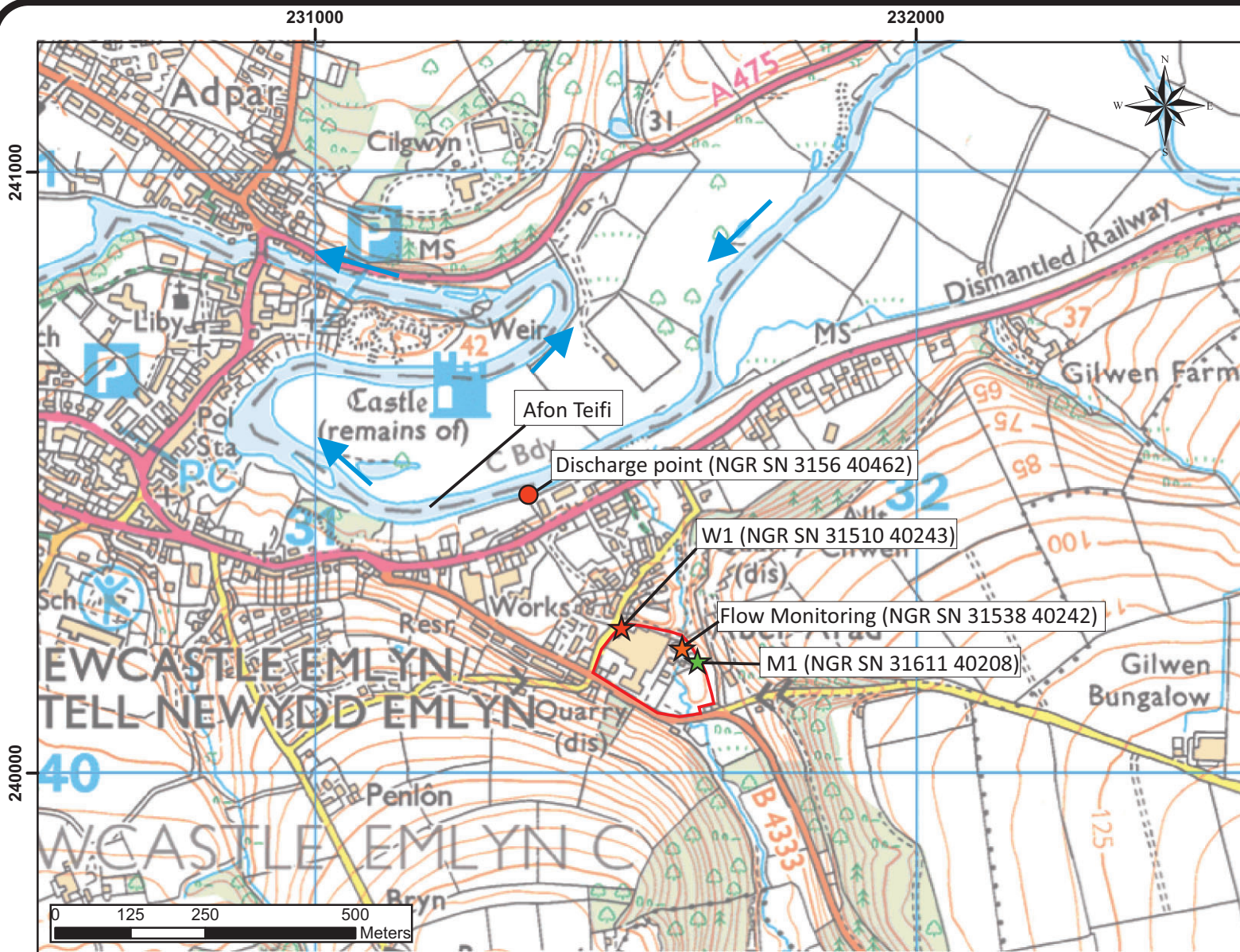


Ref: P20-197/Dairy Partners SW Risk Assessment/
 FIG 1 Site Setting.cdr
 Date: 25/09/2020

Dairy Partners Ltd

Figure 1

Site Setting



KEY

- Approx Site Boundary
- ★ W1 (NGR SN 31510 40243)
- ★ M1 (NGR SN 31611 40208)
- Discharge point on Afon Teifi (NGR SN 3156 40462)
- ★ Flow Monitoring Location (NGR SN 31538 40242)
- ➔ Direction of flow

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Date:06/10/2020

Dairy Partners Ltd

Figure 2

Site Layout

2.2 Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI)

The Afon Teifi is designated as both a Special Area of Conservation (SAC) and a Site of Special Scientific Interest (SSSI) (Figure 1) [Ref. 3 and 4]. The Afon Teifi has been designated as an SAC/SSSI as it provides an important habitat for a number of vegetative species associated with watercourses at plain to montane levels including; water-crowfoots (*Ranunculus* spp.), floating water-plantain (*Luronium natans*) and Callitricho-Batrachion vegetation. Furthermore, the river is home to the Atlantic Salmon, European Bullhead, Brook Lamprey, River Lamprey and the Eurasian Otter.

2.3 Water Quality Targets

Water Quality Targets for the Afon Teifi are determined under both the Water Framework Directive (WFD) and those set by the Joint Nature Conservation Committee (JNCC) in relation to SAC rivers. Targets set under the WFD are presented in Table 1. Targets set by the WFD include Annual Average Environmental Quality Standards (AA-EQS) and Maximum Allowable Concentrations (MAC). A target parameter may have both an AA-EQS and a MAC or just one quality target. Table 2 presents water quality targets set by the JNCC for SAC rivers.

Table 1 WFD Water Quality Targets

Parameter	AA-EQS	MAC
Aluminium (total)	Not available	1 mg/L
Aluminium (dissolved)*	Not available	10 mg/L
pH	Not available	6.0 – 9.0
Mercury (dissolved)	Not available	0.07 µg/L
Cadmium (dissolved) for a water hardness of 40 mg/L to <50 mg/L	0.008 µg/L	0.45 µg/L

* Subject to a maximum if 1:10 dilution

Table 2 JNCC Water Quality Targets for SAC Rivers

Parameter	Target (mg/L)
Mean BOD	1.5
90%ile total ammonia (NH ₃ -N)	0.25
95%ile un-ionised ammonia (NH ₃ -N)	0.025
Soluble Reactive Phosphorus (For - Low altitude, low alkalinity, river *)	20

* If targets for good ecological status under the WFD are more stringent then these apply

3 CURRENT DISCHARGE PERMIT CONDITIONS

Dairy Partners current discharge permit allows a maximum daily discharge of 1,053 m³/d. Details of the permit conditions are summarised in Table 3. Effluent is discharged from the Site at NGR SN 31510 40243 (known as W1) (Figure 2). The effluent is then transferred via pipe to the discharge point on the Afon Teifi (receiving water) at NGR SN 31356 40462 (Figure 2).

Effluent quality is monitored at the final effluent sump at NGR SN 31611 40208 (known as M1) (Figure 2). Flow rates are monitored at NGR SN 31538 40242 (Figure 2).

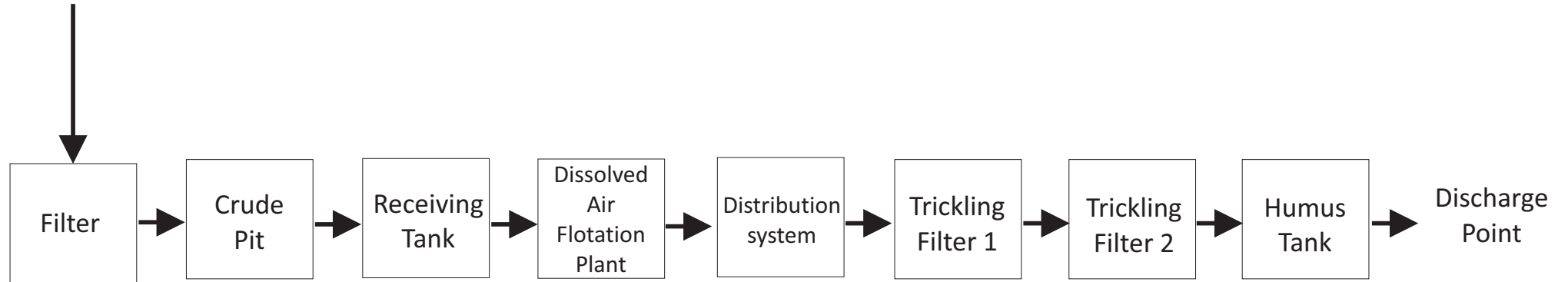
Table 3 Current Discharge Permit Conditions

Parameter	Emission Limit	Units	Type of Monitoring	Monitoring location
Discharge Volume	1,050	m ³ /d	Continuous	Flow monitoring location (NGR SN 31538 40242)
Chemical Oxygen Demand (COD)	120	mg/L	Daily	M1
Total Suspended Solids	50	mg/L	Monthly	M1
Ammonia as N	22	mg/L	Monthly	M1
Temperature	21	°C	Monthly	M1
Nitrite as N	3	mg/L	Monthly	M1
Mercury	0.5	µg/L	Annually	M1
Cadmium	0.01	mg/L	Annually	M1

4 EXISTING TREATMENT PROCESS (ETP)

A schematic of the existing ETP is presented on Figure 3. Untreated effluent is screened through a mesh filter before entering the 'crude pit'. The effluent is then pumped into the receiving tanks before being transferred into a Dissolved Air Flotation (DAF) plant which is used to remove fat. From here the effluent is transferred to a receiving distribution system from which it is distributed to two trickling filters in series where bacterial populations remove the soluble biodegradable contents of the effluent. The effluent then flows into a humus tank where any bacterial flocs which have carried over in the effluent are removed. The treated effluent is then pumped to the discharge point on the Afon Teifi.

Raw Dairy Influent



5 NEW EFFLUENT TREATMENT PROCESS

Once commissioned, the new ETP will totally replace the existing ETP which will be decommissioned.

A schematic of the new ETP is presented on Figure 4. Untreated effluent will be screened by the existing mesh filter before entering the existing 'crude pit'. The effluent will then be pumped into the balance tank which will have a pH control system. Effluent from the balance tank will then be pumped into a DAF plant where flocculent, coagulant and neutraliser will be dosed for efficient fat removal. Effluent from the DAF plant will then be pumped to a transfer tank before being pumped to an activated sludge process (ASP) where bacterial populations will remove the soluble biodegradable contents of the effluent. Phosphoric acid and urea will be dosed into the ASP to ensure a correct nutrient balance is obtained. After treatment in the ASP the effluent will be pumped into a second DAF plant where the biomass will be separated from the treated effluent, assisted by polymer dosing. A continuous monitoring system will monitor the treated effluent quality for pre-set values of Chemical Oxygen Demand (COD), suspended solids and ammonia. The treated effluent will then be discharged to the existing discharge location.

6 VARIATION

Dairy Partners have applied for a 'Normal Variation' to update the existing permit to permit the new effluent treatment plant. Table 4 presents the proposed changes. The proposed changes reduce discharge limits and therefore represent betterment to the environment.

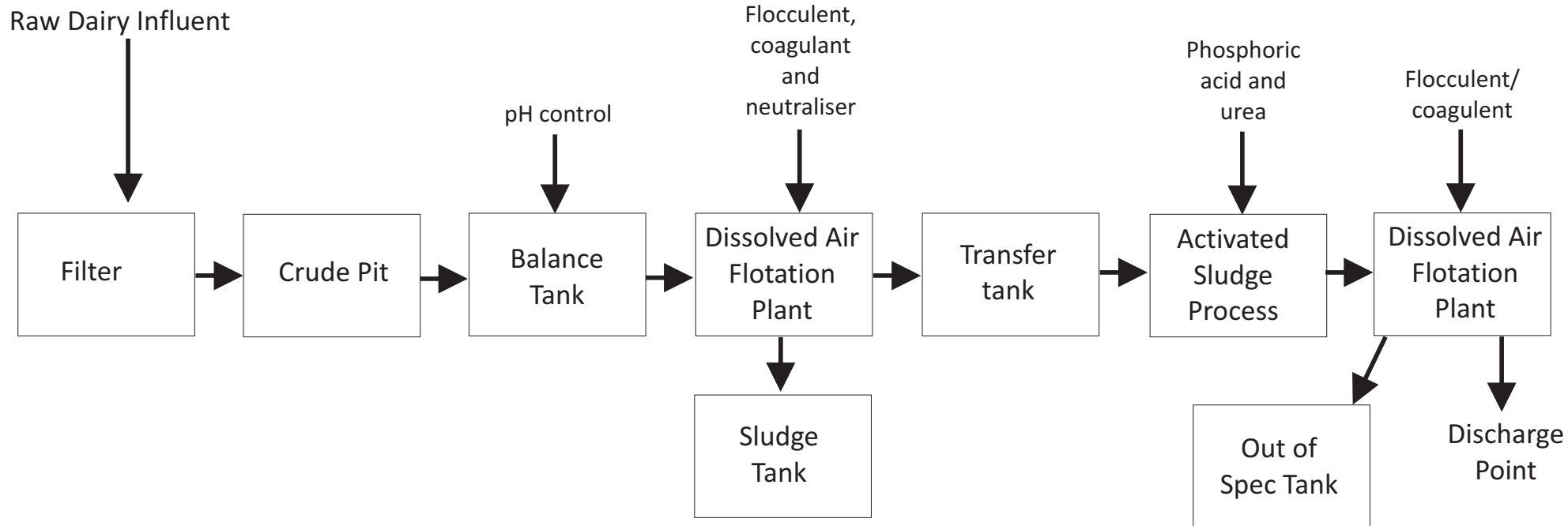
Table 4 Proposed Variation to Existing Discharge Permit

	Existing Permit	Proposed Variation
ETP	Treatment via DAF and Tricking Filter	Treatment via DAF and Activated Sludge Process
Flow (m ³ /d)	1,050	
Temperature (°C)	21	
COD (mg/L)	120	110
Total Suspended Solids (TSS) (mg/L)	50	40
Ammonia as N (mg/L)	22	20
Temperature (°C)	25	
Nitrite as N (mg/L)	3	
Mercury (µg/L)	0.3	
Cadmium (µg/L)	0.1	

7 FLOW ESTIMATION FOR THE AVON TEIFI AT EXISTING DISCHARGE POINT

In order to assess the potential impact of the discharge, the flow rate of the Avon Teifi is required at the discharge point (NGR SN 31356 40462).

Measured flow data is not available at the discharge point and therefore the flow has been calculated and verified using catchment data from the Flood Estimation Handbook Web Service (FEH) [Ref.5] in combination with LowFlows 2 software [Ref.6] and an areal reduction of catchment scale data collected at the Glanteifi gauge.



The catchment area at the discharge point is 702 km², which is illustrated on Figure 5. The LowFlows2 Q95 and Qmean flows are provided in Table 5. The Q95 flow at the discharge point is 233,000 m³/d.

This Q95 flow was compared against data from the National Rivers Archive [Ref. 7] for the Glanteifi gauge on the Avon Teifi downstream of the Site. An areal reduction on the Glanteifi Q95 flow rate gives a flow rate at the Site of 223,000 m³/d. The two calculations are within 10% of each other and therefore the Low Flows estimate is considered verified. The LowFlows2 calculation is considered the more reliable calculation, as it is based on the catchment characteristics for the catchment to the discharge point. As such this value has been used in ongoing calculations. The close agreement between the two values, means that there is no material difference between them in terms of the risk assessment.

Table 5 Low Flow Estimates at Discharge Point

	Flow (m³/s)	Flow (m³/d)
Q mean	23.3	2,010,000
Q95	2.7	233,000

8 RISK ASSESSMENT

8.1 Approach

A risk assessment has been completed following NRW's technical guidance [Refs. 8 to 11]. The risk assessment takes account of the presence of any freshwater specific pollutants (SP), priority hazardous substances (PHS) and priority substances (PS) [Ref. 8] as well as other pollutants which require assessment including sanitary determinands and other pollutants [Ref. 11]. A screening process was conducted to identify pollutants requiring assessment.

Mercury and Cadmium are both considered to be PHS and screening tests have been conducted for both using the H1 risk assessment tool.

Ammonia, BOD, suspended solids, phosphorous, pH and temperature have been assessed according to the guidelines available for sanitary determinands [Ref. 7].

The use of aluminium will be managed according to Dairy Partners Management System in accordance with NRW's guidance on the use of chemicals within water treatment processes [Ref. 6], and has been assessed on that basis.



8.2 Effluent Characterisation

The treated effluent characterisation has been determined based on:

- The new ETP specification [Appendix A]
- Existing treated effluent quality data [Appendix B]
- Untreated effluent characterisation data
- Envireau Water's and the ETP designer's knowledge and experience of removal efficiency



KEY

-  Site Location
-  FEH Catchment (702 km²)

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 FIG 5 FEH Catchment.cdr
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Figure 5

Discharge Point FEH Catchment

The approach that has been taken is robust within the context of this risk assessment, and in addition a conservative approach has been taken when defining the effluent characterisation by applying the lowest expected removal efficiencies.

Table 6 Effluent Characterisation for the New ETP

	Treated Water Quality	Source
Mercury	0.5 µg/L	Specification
Cadmium	0.5 µg/L	Removal Efficiency
Chemical Oxygen Demand	37 mg/L	Existing Effluent Quality
Biological Oxygen Demand (BOD ₅)	20 mg/L	Specification
Total Suspended Solids	30 mg/L	Specification
Ammonia as N	10 mg/L	Specification
Nitrite	1 mg/L	Specification
Phosphate as P	1 mg/L	Specification
Aluminium	1 mg/L	Specification
Flow rate	1,050 m ³ /d	Existing Permit

8.3 H1 Assessment

A screening test (H1 risk assessment) is required to assess the potential impact of the discharge of mercury and cadmium to the Avon Teifi. Screening tests follow a tiered approach (Screening Test 1-4), with each subsequent test requiring progressively more information. Screening Test 1 considers the pollutant concentration in the discharge in relation to the environmental quality standard (EQS). Screening Test 2 considers the pollutant dilution in the receiving water.

Key data relevant to the Screening tests is presented in Table 7. Outputs from the H1 risk assessment are presented in Appendix C.

Table 7 Key Data for Freshwater Screening Tests

Data	Value
Maximum mercury concentration in treated effluent	0.5 µg/L
Maximum cadmium concentration in treated effluent	0.525 µg/L
Maximum effluent flow rate	0.012 m ³ /s / 1,050 m ³ /d
Q95 at discharge point	2.7 m ³ /s

8.3.1 Mercury Screening Tests

The maximum concentration of mercury in the discharge is 0.5 µg/L which is 714 % of the Maximum Allowable Concentration (MAC) EQS of 0.07 µg/L. As the concentration of mercury exceeds 10% of the EQS Screening Test 2 was undertaken.

The process contribution (PC) of mercury is 0.0022 µg/l which represents 3.14% of the MAC-EQS. The PC of mercury is therefore less than 4% of the EQS and Screening Test 2 is passed.

The potential impact from mercury is screened out and no further tests were required.

8.3.2 Cadmium Screening Tests

The maximum concentration of cadmium in the discharge is 0.525 µg/L which is 656% of the EQS of 0.08 µg/L. As the concentration of cadmium exceeds 10% of the EQS Screening Test 2 was undertaken.

The process contribution of cadmium is 0.00236 µg/L which represents 2.95 % of the EQS. The PC of cadmium is therefore less than 4% of the EQS and Screening Test 2 is passed.

The potential impact from cadmium is screened out and no further tests were required.

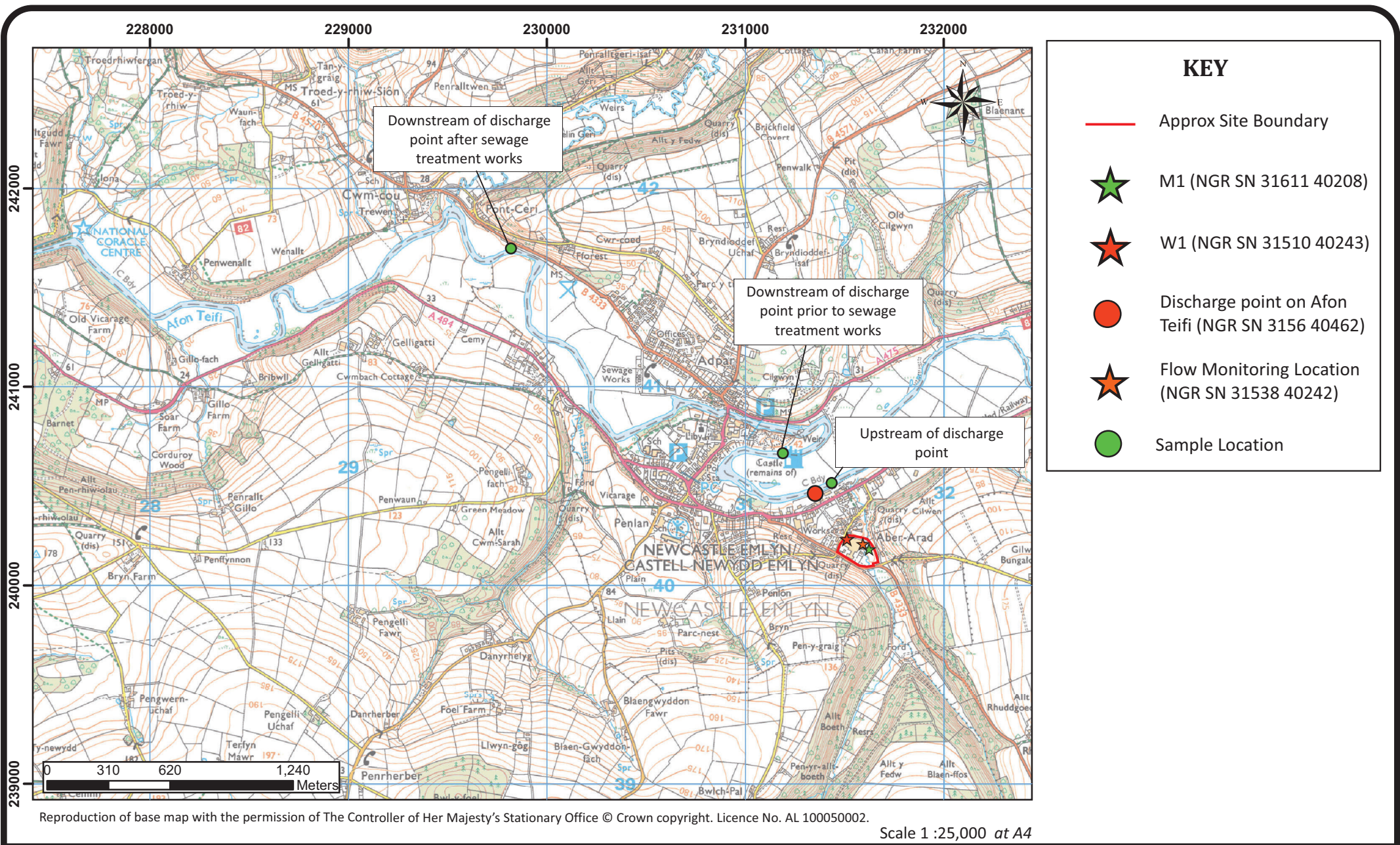
8.4 Sanitary Determinands

In order for a surface water discharge to be considered acceptable it must be demonstrated that the discharge will not cause any deterioration in the quality of the receiving waterbody and that the discharge will not prevent the waterbody from meeting its target quality standards [Ref.11]. The Afon Teifi is designated as a SAC and SSSI and therefore consideration must be given to both the WFD water quality targets and the JNCC water quality targets (Table 1 and 2).

No easily accessible data exists for the current water quality with respect to sanitary determinands in the Afon Teifi. Therefore water samples were collected at three locations to assess whether current water quality targets for the Afon Teifi are being met and to determine the impact of Dairy Partners' discharge on the Afon Teifi.

Sampling was carried out with reference to British Standard ISO 5667 (Water Quality Sampling). Water Samples were submitted to a UKAS accredited laboratory for analysis (Element). The water sampling locations are presented on Figure 6.

A water sample was collected 10m upstream of the existing discharge point to determine background water quality. A second water sample was collected at SN 30760 40724 to determine water quality downstream of the discharge location. This location was greater than ten river widths downstream of the discharge location to ensure sufficient mixing of the water below the discharge location. A third water sample was collected at SN 29904 41448, which is below the discharge point from the local sewage treatment works and was selected to assess the water quality associated with the downstream SAC.



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Date:27/10/2020

Dairy Partners Ltd

Figure 6

Water Sampling Locations

Measured flow data was not available at the sampling locations and therefore the Q95 flow was estimated following the methodology presented in Section 7. Using these methods, the Q95 flow was shown to not vary within the limit of accuracy of the calculation, do to the relatively small increase in catchment area (Figure 7), when compared to the total catchment area. Therefore, the analysis and risk assessment assumes that the discharge does not receive further dilution between the discharge point and the SAC/SSSI. This is considered a conservative approach. Table 8 presents key data used for the sanitary determinand tests.

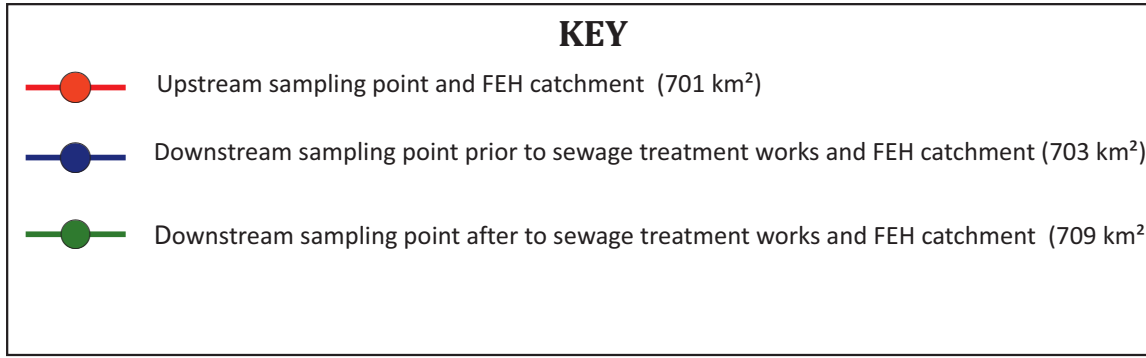
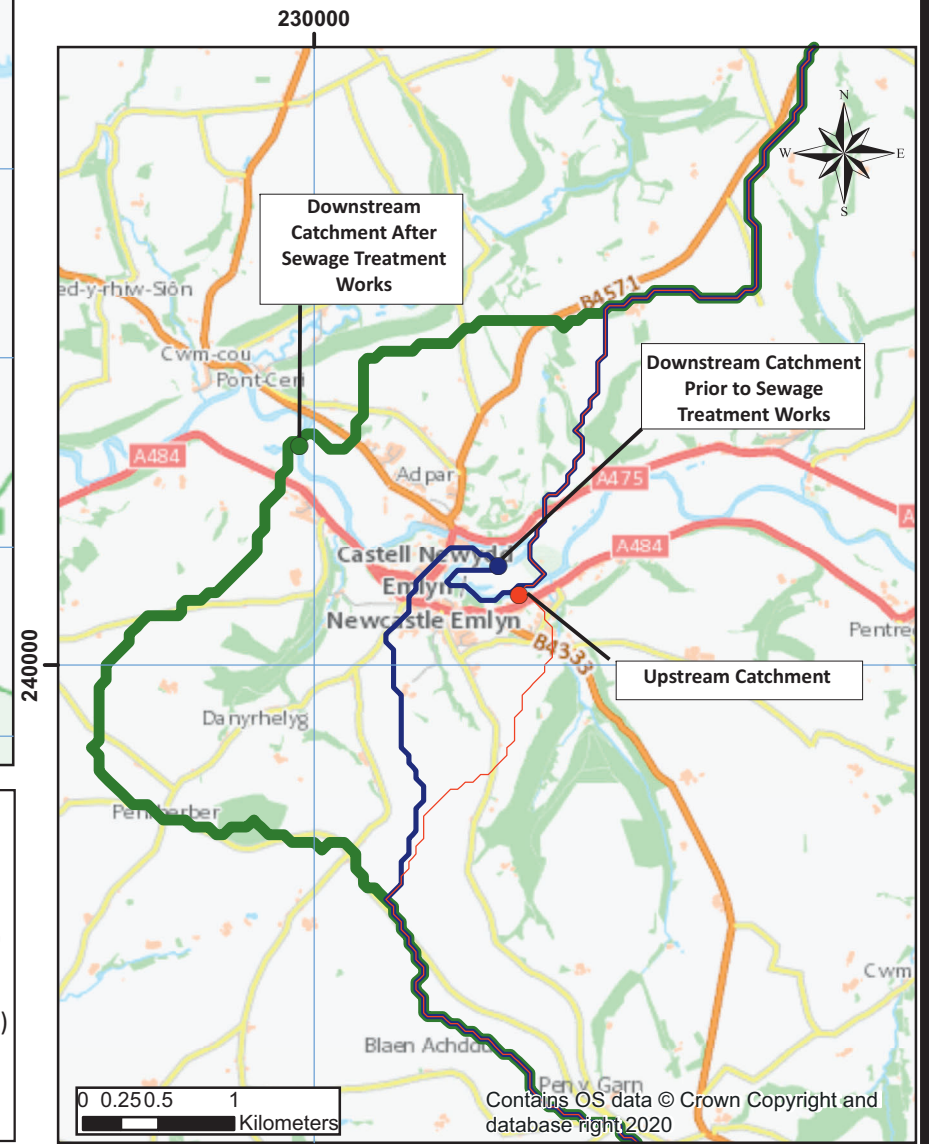
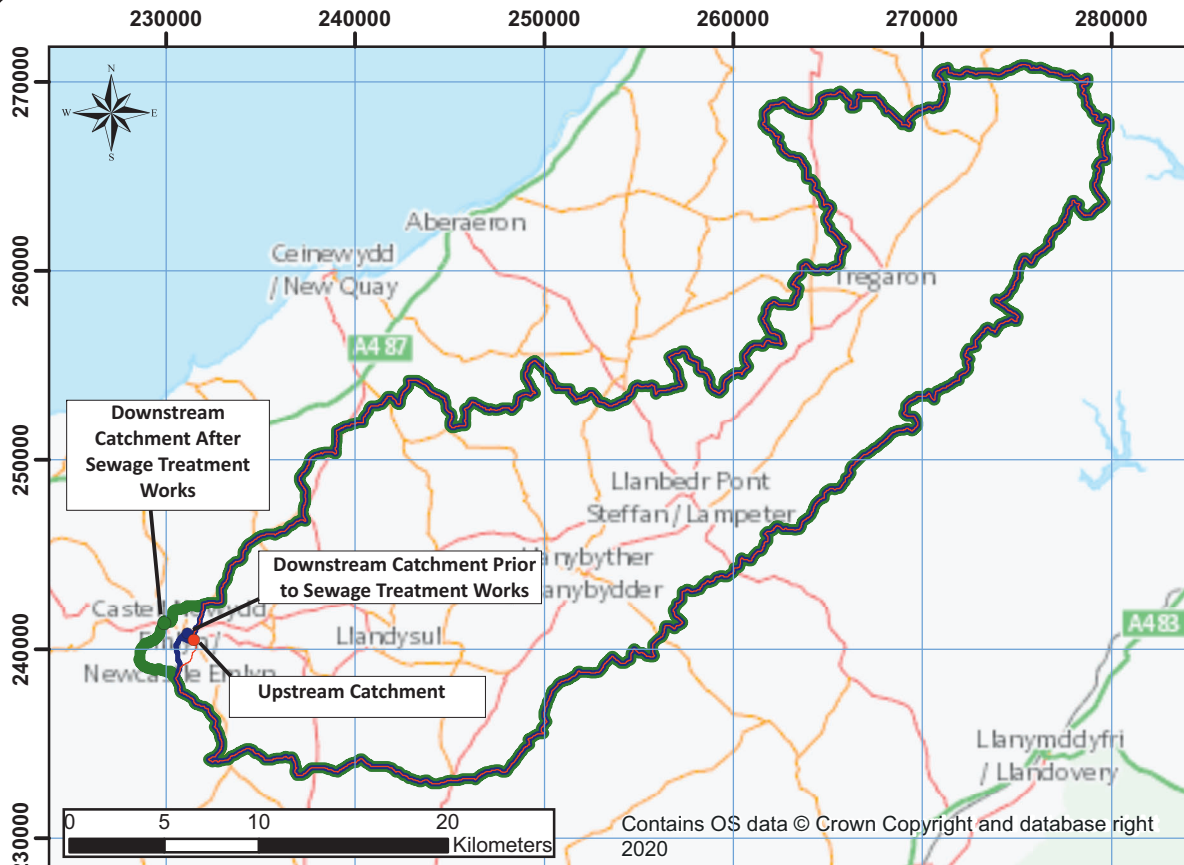
Table 8 Key Data for Sanitary Determinand Tests

Parameter	Upstream	Discharge Point	Downstream Prior to Sewage Treatment Works	Downstream of Sewage Treatment works	Target Water Quality
Receiving water Q95 flow (m ³ /s)	2.7	2.7	2.7	2.7	n/a
Effluent Discharge Rate (m ³ /d)	n/a	1,050	n/a	n/a	n/a
Biological Oxygen Demand (BOD ₅) (mg/L)	<1	20	<1	<1	1.5
Total ammonia (NH ₃ -N) (mg/L)	0.033	10	<0.025	<0.025	0.25
Un-ionised ammonia (NH ₃ -N) (mg/L)	<0.006	0 – 3.6	<0.006	<0.006	0.025
Phosphate as P (mg/L)	<0.06	1	<0.06	<0.06	20
Total suspended solids (mg/L)	<10	30	<10	<10	n/a
pH	7.69	6.0 - 9.0	7.56	7.44	6.0 - 9.0

The measured water quality data indicates that the water quality both upstream and downstream of the discharge point is currently meeting the water quality targets for the Afon Teifi.

In order to assess the impact of the discharge on the downstream water quality and therefore assess any potential impacts on the Afon Teifi SAC the contribution of each of the sanitary determinands present in the discharge on the river quality was calculated.

At a treated effluent discharge rate of 1,050 m³/d and a river Q95 flow rate of 233,000 m³/d the discharged effluent is diluted by a factor of 0.0045 at low flows. Applying this dilution to the release concentration (Table 9) enables the calculation of the contribution to the Afon Teifi.



Ref: P20-197/Dairy Partners SW Risk Assessment/FIG 7 Sample Point FEH Catchments.cdr
Date: 28/10/2020

Dairy Partners Ltd

Figure 7

Sample Point FEH Catchments

Table 9 Contribution of Sanitary Determinands in the Discharge to the Afon Teifi

Parameter	Release Concentration	Contribution to the Afon Teifi	Target Water Quality
Biological Oxygen Demand (BOD ₅) (mg/L)	20	0.09	1.5
Total ammonia (NH ₃ -N) (mg/L)	10	0.045	0.25
Un-ionised ammonia (NH ₃ -N) (mg/L) (pH 6 – 9)	0 – 3.6	0 - 0.016	0.025
Phosphate as P (mg/L)	1	0.005	20
Total suspended solids (mg/L)	30	0.14	n/a

The contribution of un-ionised ammonia will vary dependent upon the pH of the effluent, however un-ionised ammonia is only present in notable concentrations at a pH of close to 9. The operation of the new ETP will rarely reach pH 9 because of the pH control in the system. However, the analysis assumes a permitted range of pH 6 to 9.

Table 9 shows that at a Q95 flow:

- The discharge will contribute 0.09 mg/L BOD to the Afon Teifi. The contribution of BOD will not affect the ability to meet the water quality target of 1.5 mg/L in the Afon Teifi.
- The discharge will contribute 0.045 mg/L total ammonia to the Afon Teifi. The contribution of total ammonia will not affect the ability to meet the water quality target of 0.25 mg/L in the Afon Teifi.
- Taking a conservative approach at pH 9, the discharge will contribute a maximum of 0.016 mg/L of un-ionised ammonia to the Afon Teifi. The contribution of un-ionised ammonia will not affect the ability to meet the water quality target of 0.025 mg/L in the Afon Teifi.
- The discharge will contribute 0.005 mg/L phosphate to the Afon Teifi. The contribution of phosphate will not affect the ability to meet the water quality target of 20 mg/L in the Afon Teifi.
- The discharge will contribute 0.14 mg/L of suspended solids to the Afon Teifi. The contribution of suspended solids will not affect the water quality in the Afon Teifi.

The discharge will not affect lead to a deterioration in the WFD status of the Afon Teifi or impact on the SAC/SSSI.

8.5 Use of Chemicals in Treatment (Aluminium)

Aluminium is present in the effluent as a residual from the use of polyelectrolytes in the DAF plant. Dairy Partners will use AQUATREAT 602X (Appendix D) which is composed of aluminium chloride hydroxide.

Dairy Partners will ensure that the use of aluminium based polyelectrolytes are controlled in such a way to ensure that the permitted concentration for aluminium is not exceeded and therefore that there is no impact on the Avon Teifi.

9 SUMMARY

The outcomes from the risk assessment of the proposed discharge limits on the Afon Teifi are presented in Table 10.

Table 10 Impact of the Proposed Discharge on the Afon Teifi

	Discharge Concentration	Does the Discharge Lead to a Deterioration in the Receiving Waterbody or Prevent Water Quality Targets from being Met?
Mercury	0.5 µg/L	No
Cadmium	0.5 µg/L	No
Biological Oxygen Demand (BOD ₅) (mg/L)	20 mg/L	No
Total ammonia (NH ₃ -N) (mg/L)	10 mg/L	No
Un-ionised ammonia (NH ₃ -N) (mg/L) (pH 6 – 9)	0 – 3.6 mg/L	No
Phosphate as P (mg/L)	1 mg/L	No
Total suspended solids (mg/L)	30 mg/L	No

10 CONCLUSIONS

Dairy Partners have requested a variation to their permit to discharge into the Afon Teifi at their site in Newcastle Emlyn, in order to permit a new effluent treatment plant, which replaces their existing effluent treatment plant.

The proposed discharge limits are less than those in the existing permit.

A risk assessment has been completed to support the variation application which follows NRW guidance.

The risk assessment has considered mercury and cadmium which are Priority Hazardous Substances as well as sanitary determinands within the discharge. The use of aluminium in coagulants has also been considered.

The completion of a two tier H1 risk assessment screened out any impact from both mercury and cadmium.

An assessment of the sanitary determinands BOD, total ammonia, unionised ammonia, phosphate and suspended solids demonstrated that the discharge would not lead to a deterioration in the water quality in the Afon Teifi or prevent water quality targets being met in the Afon Teifi SAC/SSSI.

Permitting the discharge will not affect or lead to a deterioration in the WFD status of the Afon Teifi or impact on the SAC/SSSI, and due to the proposed lower discharge limits will contribute to betterment.

Envireau Water
29/10/20

REFERENCES

- Ref.1 Natural Resources Wales. 2016. Teifi and North Ceredigion Management Catchment Summary.
- Ref.2 Natural Resources Wales. <https://waterwatchwales.naturalresourceswales.gov.uk/en/>. [Accessed: 16/10/2020].
- Ref.3 JNCC. Afon Teifi/River Teifi. Designated Special Area of Conservation (SAC). <https://sac.jncc.gov.uk/site/UK0012670>. Accessed: 12/10/2020].
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- Ref.5 Flood Estimation Handbook: FEH Web Service, Centre for Ecology & Hydrology 2020.
- Ref.6 LowFlows 2, Wallingford Hydrosolutions 2020
- Ref.7 National Rivers Archive. <https://nrfa.ceh.ac.uk/data/station/meanflow/62001>. [Accessed 20/10/2020].
- Ref.8 Environment Agency. Surface water pollution risk assessment for your environmental permit. <https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit>. Published 1st February 2016, last updated 23 June 2020. [Accessed: 03/10/2020].
- Ref.9 Natural Resources Wales. How to comply with your environmental Permit. <https://naturalresources.wales/media/2124/how-to-comply-with-your-environmental-permit-additional-guidance-for-water-discharge-and-groundwater-from-point-source.pdf>. [Accessed: 03/10/2020].
- Ref.10 Environment Agency. H1 Environmental risk assessment for permits: overview and annexes. <https://www.gov.uk/government/publications/h1-environmental-risk-assessment-for-permits-overview>. Published 26 January 2012, last updated 14 December 2015. [Accessed: 03/10/2020].
- Ref.11 Environment Agency. H1 Annex D2. Assessment of sanitary and other pollutants within surface water discharge. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/489146/H1_annex_D2.pdf. [Accessed 16/10/2020].

**APPENDIX A
NEW EFFLUENT TREATMENT PLANT SPECIFICATION**

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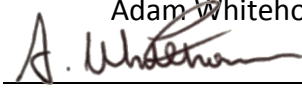
Tel: 01269 844558
Fax: 01269 841867
Email: info@decusuk.co.uk

Certificate of Analysis Number: 3418.2 Rev.1

Project/Site name:	Altair Analytical	Samples Taken:	16-10-2019
Order Number:	KMW16102019-01	Samples Received:	16-10-2019
Quote Number:	DS191003	Date Instructed:	22-10-2019
Sample Matrix:	Effluent Water	Analysis Complete:	01-11-2019
		Report Issued:	01-11-2019
		Sampled By:	Client

Amendment Records:

Nitrate analysis changed for nitrite analysis

Approved by: Adam Whitehouse
Signature: 
Title: Laboratory Manager



Client: Altair Analytical
FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3418.2
Rev.1

Report Date
01st November 2019

Results of analysis of 1 sample received on
the 16/10/19

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				221019046	-	-	-
Client Sample Reference:				331726	-	-	-
Sample Date:				16/10/19	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L05	COD	mg.l ⁻¹ O ₂	A	25	-	-	-
INORG-L10	Suspended Solids	mg.l ⁻¹	A	2.0	-	-	-
INORG-L06.1	BOD	mg.l ⁻¹ O ₂	A	3.5	-	-	-
INORG-L12	Ammonia	mg.l ⁻¹ NH ₄	A	13.7	-	-	-
INORG-L14	Nitrite	mg.l ⁻¹ as N	A	0.41	-	-	-

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Client: Altair Analytical
FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3418.2
Rev.1

Report Date
01st November 2019

Results of analysis of 1 sample received on
the 16/10/19

Analytical Method	Method Code	Accreditation Status
Determination of COD in water by colorimetric analysis (In-house method)	INORG-L05	ISO 17025
Determination of Suspended Solids in water by gravimetric analysis at 105°C (In-house method)	INORG-L10	ISO 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO 17025
Determination of Ammonia in water by colorimetric analysis (In-house method)	INORG-L12	ISO 17025
Determination of Nitrite in water by colorimetric analysis (In-house method)	INORG-L14	ISO 17025

Disposal Times:

All water samples will be retained for a period of two weeks and all soil samples retained for a period of one month following the date of the issued certificate.

All results only relate to the samples as received.

This report supersedes any previous versions issued by the laboratory.

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[B]: Sample age exceeds recommended storage time

[C]: Samples not received in appropriate containers

[D]: Broken Container

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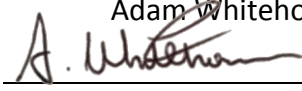
Tel: 01269 844558
Fax: 01269 841867
Email: info@decusuk.co.uk

Certificate of Analysis Number: 3479

Project/Site name:	Altair Analytical	Samples Taken:	21-11-2019
Order Number:	KMW21112019-01	Samples Received:	22-11-2019
Quote Number:	DS191105	Date Instructed:	22-11-2019
Sample Matrix:	Effluent Water	Analysis Complete:	06-12-2019
		Report Issued:	10-12-2019
		Sampled By:	Client

Amendment Records:

None

Approved by: Adam Whitehouse
Signature: 
Title: Laboratory Manager



Client: Altair Analytical
FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3479

Report Date
10th December 2019

Results of analysis of 1 sample received on
the 22/11/19

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				231119002	-	-	-
Client Sample Reference:				338942	-	-	-
Sample Date:				21/11/19	-	-	-
Sample Matrix:				Effluent Water	-	-	-
INORG-L05	COD	mg.l ⁻¹ O ₂	A	72	-	-	-
INORG-L10	Suspended Solids	mg.l ⁻¹	A	40	-	-	-
INORG-L06.1	BOD	mg.l ⁻¹ O ₂	A	3.5	-	-	-
INORG-L12	Ammonia	mg.l ⁻¹ NH ₄	A	9.0	-	-	-
INORG-L11	Nitrate	mg.l ⁻¹ NO ₃	N	8.8	-	-	-

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Client: Altair Analytical
 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3479

Report Date
 10th December 2019

Results of analysis of 1 sample received on
 the 22/11/19

Analytical Method	Method Code	Accreditation Status
Determination of nitrate in water by colorimetric analysis (In-house method)	INORG-L11	None
Determination of COD in water by colorimetric analysis (In-house method)	INORG-L05	ISO 17025
Determination of Suspended Solids in water by gravimetric analysis at 105°C (In-house method)	INORG-L10	ISO 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO 17025
Determination of Ammonia in water by colorimetric analysis (In-house method)	INORG-L12	ISO 17025

Disposal Times:

All water samples will be retained for a period of two weeks and all soil samples retained for a period of one month following the date of the issued certificate.

All results only relate to the samples as received.

This report supersedes any previous versions issued by the laboratory.

A full list of determinants relating to abbreviations such as PAHs, VOCs, SVOCs, PCBs etc. is available upon request.

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- [U/S]: Unsuitable Sample
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- [C]: Samples not received in appropriate containers
- [D]: Broken Container
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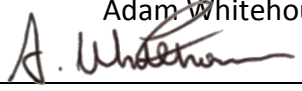
Tel: 01269 844558
Fax: 01269 841867
Email: info@decusuk.co.uk

Certificate of Analysis Number: 3503.2

Project/Site name:	Altair Analytical	Samples Taken:	03-12-2019
Order Number:	KWM04122019-02	Samples Received:	05-12-2019
Quote Number:	DS190708	Date Instructed:	05-12-2019
Sample Matrix:	Effluent Water	Analysis Complete:	19-12-2019
		Report Issued:	02-01-2020
		Sampled By:	Client

Amendment Records:

None

Approved by: Adam Whitehouse
Signature: 
Title: Laboratory Manager



Client: Altair Analytical
FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3503.2

Report Date
02nd January 2020

Results of analysis of 1 sample received on
the 04/12/19

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				051219023	-	-	-
Client Sample Reference:				341845	-	-	-
Sample Date:				04/12/19	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L05	COD	mg.l ⁻¹ O ₂	A	2	-	-	-
INORG-L10	Suspended Solids	mg.l ⁻¹	A	38.0	-	-	-
INORG-L06.1	BOD	mg.l ⁻¹ O ₂	A	9.9	-	-	-
INORG-L12	Ammonia	mg.l ⁻¹ as NH ₄	A	26	-	-	-
INORG-L14	Nitrite	mg.l ⁻¹ as N	A	2.26	-	-	-

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Client: Altair Analytical
 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3503.2

Report Date
 02nd January 2020

Results of analysis of 1 sample received on
 the 04/12/19

Analytical Method	Method Code	Accreditation Status
Determination of COD in water by colorimetric analysis (In-house method)	INORG-L05	ISO 17025
Determination of Suspended Solids in water by gravimetric analysis at 105°C (In-house method)	INORG-L10	ISO 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO 17025
Determination of Ammonia in waters by colorimetric photometer (In-house method)	INORG-L12	ISO 17025
Determination of Nitrite in waters by photometer (In-house method)	INORG-L14	ISO 17025

Disposal Times:

All water samples will be retained for a period of two weeks and all soil samples retained for a period of one month following the date of the issued certificate.

All results only relate to the samples as received.

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A full list of determinants relating to abbreviations such as PAHs, VOCs, SVOCs, PCBs etc. is available upon request.

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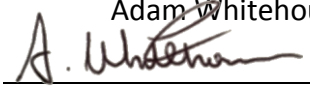
Tel: 01269 844558
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Certificate of Analysis Number: 3581

Project/Site name:	Altair Analytical	Samples Taken:	15-01-2020
Order Number:	KMW160120-02	Samples Received:	17-01-2020
Quote Number:	DS191105	Date Instructed:	17-01-2020
Sample Matrix:	Effluent Water	Analysis Complete:	24-01-2020
		Report Issued:	27-01-2020
		Sampled By:	Client

Amendment Records:

None

Approved by: Adam Whitehouse
Signature: 
Title: Laboratory Manager



Client: Altair Analytical
FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3581

Report Date
27th January 2020

Results of analysis of 1 sample received on
the 15/01/20

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				170120010	-	-	-
Client Sample Reference:				349192	-	-	-
Sample Date:				15/01/20	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L05	COD	mg.l ⁻¹ O ₂	A	38	-	-	-
INORG-L10	Suspended Solids	mg.l ⁻¹	A	52	-	-	-
INORG-L06.1	BOD	mg.l ⁻¹ O ₂	A	12.9	-	-	-
INORG-L12	Ammonia	mg.l ⁻¹ as NH ₄	A	10.1	-	-	-
INORG-L14	Nitrite	mg.l ⁻¹ as N	A	1.09	-	-	-

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Client: Altair Analytical
 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3581

Report Date
 27th January 2020

Results of analysis of 1 sample received on
 the 15/01/20

Analytical Method	Method Code	Accreditation Status
Determination of COD in water by colorimetric analysis (In-house method)	INORG-L05	ISO 17025
Determination of Suspended Solids in water by gravimetric analysis at 105°C (In-house method)	INORG-L10	ISO 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO 17025
Determination of Ammonia in waters by colorimetric photometer (In-house method)	INORG-L12	ISO 17025
Determination of Nitrite in waters by photometer (In-house method)	INORG-L14	ISO 17025

Disposal Times:

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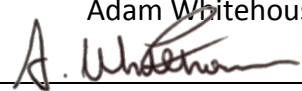
Tel: 01269 844558
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Email: info@decusuk.co.uk

Certificate of Analysis Number: 3645 Rev.3

Project/Site name:	Altair Analytical	Samples Taken:	11-02-2020
Order Number:	11/02/2020	Samples Received:	14-02-2020
Quote Number:	DS190708	Date Instructed:	14-02-2020
Sample Matrix:	Effluent Water	Analysis Complete:	24-02-2020
		Report Issued:	13-03-220
		Sampled By:	Client

Amendment Records:

Rev. 1 - Added Ammonia, Removed non requested analysis
Rev. 2 – separated results per page
Rev. 3 – Nitrite reported as Nitrogen

Approved by: Adam Whitehouse
Signature: 
Title: Laboratory Manager



Client: Altair Analytical
 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3645
Rev.3

Report Date
 13th March 2020

Results of analysis of 1 sample received on
 the 14/02/20

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				170220001	-	-	-
Client Sample Reference:				Dairy Partners	-	-	-
Sample Date:				11/02/20	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L05	COD	mg.l ⁻¹ O ₂	A	30	-	-	-

* Accreditation Status

Tests marked 'A' hold UKAS accreditation

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Tests marked 'S - N' were sub-contracted to an approved laboratory without accreditation on the specific method

Any comments or interpretations are beyond the scope of UKAS accreditation



Client: Altair Analytical
 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3645
Rev.3

Report Date
 13th March 2020

Results of analysis of 1 sample received on
 the 14/02/20

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				170220001	-	-	-
Client Sample Reference:				Dairy Partners	-	-	-
Sample Date:				11/02/20	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L10	Suspended Solids	mg.l ⁻¹	A	39.2	-	-	-

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Client: Altair Analytical
 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3645
Rev.3

Report Date
 13th March 2020

Results of analysis of 1 sample received on
 the 14/02/20

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				170220001	-	-	-
Client Sample Reference:				Dairy Partners	-	-	-
Sample Date:				11/02/20	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L06.1	BOD	mg.l ⁻¹ O ₂	A	8.1	-	-	-

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Results of analysis of 1 sample received on
 the 14/02/20

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				170220001	-	-	-
Client Sample Reference:				Dairy Partners	-	-	-
Sample Date:				11/02/20	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L14	Nitrite	mg.l ⁻¹ Nitrogen	A	1.55	-	-	-

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CERTIFICATE OF ANALYSIS 3645
Rev.3

Report Date
13th March 2020

Results of analysis of 1 sample received on
the 14/02/20

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				170220001	-	-	-
Client Sample Reference:				Dairy Partners	-	-	-
Sample Date:				11/02/20	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L12	Ammonia	mg.l ⁻¹ N	A	5.8	-	-	-

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 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3645
Rev.3

Report Date
 13th March 2020

Results of analysis of 1 sample received on
 the 14/02/20

Analytical Method	Method Code	Accreditation Status
Determination of COD in water by colorimetric analysis (In-house method)	INORG-L05	ISO 17025
Determination of Suspended Solids in water by gravimetric analysis at 105°C (In-house method)	INORG-L10	ISO 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO 17025
Determination of Nitrite in water by colorimetric analysis (In-house method)	INORG-L14	ISO 17025
Determination of Ammonia in water by colorimetric analysis (In-house method)	INORG-L12	ISO 17025

Disposal Times:

All water samples will be retained for a period of two weeks and all soil samples retained for a period of one month following the date of the issued certificate.

All results only relate to the samples as received.

This report supersedes any previous versions issued by the laboratory.

A full list of determinants relating to abbreviations such as PAHs, VOCs, SVOCs, PCBs etc. is available upon request.

Where results have been labelled as deviating for any reason, the data may not be representative of the sample at the point of sampling:

[I/S]: Insufficient Sample

[U/S]: Unsuitable Sample

[A]: Date of Sampling not supplied

[B]: Sample age exceeds recommended storage time

[C]: Samples not received in appropriate containers

[D]: Broken Container

< "Less Than"

> "Greater Than"

Where any sub-contracted results have been noted as deviating by the laboratory in question, their deviations codes will be applied and detailed.

Accreditation statements are correct at the time of issue.

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*****END OF REPORT*****

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Sharon Smallwood
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SA18 3BL

Decus Research Limited
ExCAL House
Capel Hendre Industrial Estate
Ammanford
Carmarthenshire
SA18 3SJ

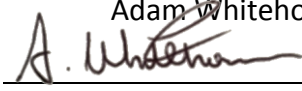
Tel: 01269 844558
Fax: 01269 841867
Email: info@decusuk.co.uk

Certificate of Analysis Number: 3671

Project/Site name:	Altair Analytical	Samples Taken:	21-02-2020
Order Number:	KMW210220-02	Samples Received:	21-02-2020
Quote Number:	DS191105	Date Instructed:	21-02-2020
Sample Matrix:	Effluent Water	Analysis Complete:	06-03-2020
		Report Issued:	09-03-2020
		Sampled By:	Client

Amendment Records:

None

Approved by: Adam Whitehouse
Signature: 
Title: Laboratory Manager



Client: Altair Analytical
FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3679

Report Date
09th March 2020

Results of analysis of 1 sample received on
the 21/02/20

Code	Determinant	Units	*	Sample Identification			
Laboratory Sample Number:				270220005	-	-	-
Client Sample Reference:				366718	-	-	-
Sample Date:				21/02/20	-	-	-
Sample Matrix:				Effluent	-	-	-
INORG-L05	COD	mg.l ⁻¹ O ₂	A	53	-	-	-
INORG-L10	Suspended Solids	mg.l ⁻¹	A	72.8	-	-	-
INORG-L06.1	BOD	mg.l ⁻¹ O ₂	A	24.1	-	-	-
INORG-L12	Ammonia	mg.l ⁻¹ as NH ₄	A	10.8	-	-	-
INORG-L14	Nitrite	mg.l ⁻¹ as N	A	<0.01	-	-	-

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Client: Altair Analytical
 FAO: Sharon Smallwood

CERTIFICATE OF ANALYSIS 3679

Report Date
 09th March 2020

Results of analysis of 1 sample received on
 the 21/02/20

Analytical Method	Method Code	Accreditation Status
Determination of COD in water by colorimetric analysis (In-house method)	INORG-L05	ISO 17025
Determination of Suspended Solids in water by gravimetric analysis at 105°C (In-house method)	INORG-L10	ISO 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO 17025
Determination of Ammonia in waters by colorimetric photometer (In-house method)	INORG-L12	ISO 17025
Determination of Nitrite in waters by photometer (In-house method)	INORG-L14	ISO 17025

Disposal Times:

All water samples will be retained for a period of two weeks and all soil samples retained for a period of one month following the date of the issued certificate.

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- [C]: Samples not received in appropriate containers
- [D]: Broken Container
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- > "Greater Than"

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APPENDIX C
MERCURY AND CADMIUM H1 RISK ASSESSMENT

Water Impacts - Fresh Water Releases

Apply Test 1 (See Guidance) and Calculate Process Contributions of Emissions to Water

This table applies Test 1 and also estimates the Process Contribution for Freshwater releases, this is calculated after dilution into the relevant surface water type for each emission to water listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dilution modelling, this may be entered as indicated and will be used instead of the estimated PC. Any releases which 'Pass' Test 1 are screened out at this point.

Substance	Annual Avg EQS			MAC EQS		
	Release µg/l	EQS µg/l	Release conc < 10% EQS Test 1	Release µg/l	MAC µg/l	Release conc < 10% EQS Test 1
[Discharge Point] Cadmium and its compounds (40 - < 50 mg/l CaCO3) (Afon Teifi)	0.5250	0.0800	Fail		0.45	Fail
[Discharge Point] Mercury and its compounds (Afon Teifi)	0.5000		N/A	0.5000	0.07	Fail

Note that the Process Contribution shown for each substance is the sum of the individual process contributions of each point from which the substance is emitted. Process Contributions obtained from modelling data should incorporate all relevant release points and flow conditions.

* If you have valid dispersion modelling data available - please enter it here

Comments:

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
Cadmium and its compounds (40 - < 50 mg/l CaCO ₃) (Afon Teifi)	0.08	0.0023		2.90	Pass	0.45			-	Pass
Mercury and its compounds (Afon Teifi)		0.0022			Pass	0.07	0.0022		3.17	Pass

Comments:

APPENDIX D
POLYELECTROLYTE ADDITION

Material Safety Data Sheet

Page 1 of 5

Section 1: Identification of Substance/mixture and of the company undertaking

1.1: Product Identifier

Product Name AQUATREAT 602X

1.2: Relevant Identified use of substance/mixture and uses advised against

1.3: Details of the Supplier of the safety data sheet

Company Name: Aquatreat

Albany House
North Dock
Llanelli
Carmarthenshire
SA15 2LF

Telephone: 01554 775236

Fax: 01554 772253

E-mail: enquiries@aquatreat.co.uk

Website: www.aquatreat.co.uk

1.4: Emergency Telephone Numbers:

Emergency Telephone: 0333 333 9499

Section 2: Hazards Identification

2.1: Classification of substance/mixture according to Regulation (EC) No 1272/2008

Classification under CLP: H290 Met Corr 1
H314 Skin Corr 1B

Additional Information:

2.2: Label Elements: Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]

Label elements under CLP: H290 May be corrosive to metals
H314 Causes severe skin burns and eye damage

Signal Words: DANGER

Hazard Pictograms:



Precautionary Statements

P301+P330+P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P308 IF exposed or concerned:

P310 Immediately call a POISON CENTER or doctor/physician.

2.3: Other Hazards

Section 3: Composition information on hazardous ingredients

Aluminium Chloride Hydroxide - Reach Reg. No 01-2119531563-43-0006

EINECS	CAS No	Classification according to Regulation (EC) 1272:2008	Percent
215-477-2	1327-41-9	Skin Corr 1B: H314	100

Section 4: First Aid Measures

4.1: Description of First Aid measures

Skin Contact: Remove contaminated clothing as quickly as possible. Wash affected area with plenty of water. Obtain medical advice if adverse symptoms persist.

Eye Contact: Immediately flood eye with copious quantities of clean water, holding eyelids open. Seek medical attention.

Ingestion: Wash out mouth with water and give water to drink. Do not induce vomiting. If unconscious do not give anything by mouth. Obtain medical attention immediately.

Inhalation: Remove patient to fresh air. If symptoms persist obtain medical attention.

4.2: Most important symptoms and effects both acute and delayed

Skin Contact: No information

Eye Contact: No Information

Ingestion: No Information

Inhalation: No Information

4.3: Indication of any immediate medical treatment and special treatment required

In case of shortness of breath give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

Section 5: Fire fighting measures

5.1: Extinguishing media

Non combustible. Use media suitable for surrounding fire. Do not use waterjet as this will spread fire

Unsuitable Media

5.2: Special hazards arising from the substance/mixture

Decomposes to give toxic and acidic dense white fumes.

5.3: Advice for firefighters

Chemical protection suit, gloves and boots. Self contained breathing apparatus.

Section 6: Accidental Release Measures

6.1: Personal precautions, protective equipment and emergency procedures

Wear appropriate PPE - rubber gloves and goggles. Avoid excessive inhalation of vapours - breathing apparatus may be required for a major spill.

6.2: Environmental precautions

Prevent further leakage or spillage. Do not allow to enter watercourses or drains

6.3: Methods and Materials for containment and clean up

Soak up with inert absorbent material. Shovel into suitable container for disposal.
Following product recovery flush area with water.

6.4: References to other sections

Section 7.0: Handling and Storage

7.1: Precautions for safe handling

Wear protective clothing as described in section 8 when handling the product. Do not eat smoke or drink whilst handling the product.

7.2: Conditions for safe storage.

Store in a cool, dry and ventilated area. Store in tightly closed original container.
Avoid uncoated metal containers.

7.4: Specific End Use(s)

Section 8: Exposurecontrols/PersonalProtection

8.1: Control Parameters

Hydrochloric Acid

8 Hour TWA: 2 mg/m³ **15MinSTEL:** No Data

8.2: Exposure Controls

Engineering Measures Ensure adequate ventilation, typically 10 air changes per hour.

Respiratory Protection Respiratory protection required in case of high vapour concs.

Hand Protection PVC or rubber gloves.

Eye Protection Goggles or face shield.

Skin Protection Lightweight protective clothing, rubber or plastic apron.

Section 9.0: Physical and ChemicalProperties

9.1: Information on basic physical and chemical properties

State: Liquid

Colour: Pale Yellow

Odour: Slight Acidic Odour

Specific Gravity: 1.24

pH: <1

9.2: Other Information

Section 10: Stability and Reactivity

10.1: Reactivity

No hazards to be specifically mentioned

10.2: Chemical Stability

Stable under normal conditions

10.3: Possibility of Hazardous Reactions

May react with certain metals to liberate highly flammable hydrogen gas.

10.4: Conditions to Avoid

No special precautions required.

10.5: Incompatible Materials

Metals, organic materials, alkali, hypochlorite.

10.6: Hazardous Decomposition Products

Section 11: Toxicological Information

No Data available

--	--	--	--

Section 12: Ecological Information

12.1: Toxicity

Spillage may cause localised damage due to low pH. If well diluted and dispersed there should be no lasting effects. LC50 Danio >1,000 mg/l 96 Hr. EC50 Daphnia 98 mg/l 48 Hr

12.2: Persistence and Biodegradable

Material should not be allowed to spill into controlled waters as damage to fish is possible. Product consists of inorganic materials which are not biodegradable.

12.3: Bioaccumulative Potential

No data available

12.4: Mobility in Soil

No data available

12.5: Results of PBT and vPvB Assessment

No Data available

12.6: Other adverse effects

No data available

Section 13: Disposal Information

Dispose of in accordance with local and national regulations.

Section 14: Transport Information

UN Number	UN 2581		
Shipping Name	ALUMINIUM CHLORIDE SOLUTION		
Transport Class	8		
Packing Group	III		
Environment Hazard	No		
Special Precautions	No special precautions required		
Tunnel Code	E	Transport Category	3

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Section 15: Regulatory Information

15.1: Safety, Health and Environmental regulations/legislation specific for the substance/mixture

15.2: Chemical safety assessment

Section 16: Other information

The above information is based on our present knowledge of the product at the time of publication. It is given in good faith, no warranty is implied as to the quality or specification of the product. Information contained in this data does not constitute an assessment of workplace risks. The user must satisfy himself that the product is entirely suitable for their purpose

APPENDIX C

Decus Limited Chemical Analysis Results



Matt Morga
Excal Ltd
Excal House
Capel Hendre Industrial Estate
Ammanford
Carmarthenshire

Decus Research Limited
ExCAL House
Capel Hendre Industrial Estate
Ammanford
Carmarthenshire
SA18 3SJ

Tel: 01269 844558
Fax: 01269 841867
Email: info@decusuk.co.uk

Certificate of Analysis Number: 7217

Project/Site name:	Dairy Partners
Quotation Number:	DS231105
Order Number:	-
Sample Matrix:	Effluent, Surface Water

Samples Taken:	01/12/2023
Samples Received:	01/12/2023
Date Instructed:	01/12/2023
Analysis Complete:	06/12/2023
Report Issued:	13/12/2023
Sampled By:	A Bowen / M Swift

Amendment Records:
None



4303

Approved by: Adam Whitehouse

Signature: _____

Title: Laboratory Manager

Code	Determinand	Units	*	Sample Identification		
Laboratory Sample Number:				011223003	011223004	011223005
Client Sample Reference:				DP - Effluent	DP - 10m (Up)	DP - Downstream
Sample Date & Time:				01/12/2023	01/12/2023	01/12/2023
Sample Matrix:				Effluent	Surface Water	Surface Water
INORG-L11	Total Oxidised Nitrogen	mg.l ⁻¹ as N	A	2.6	3.0	2.2
INORG-L24	Total Nitrogen	mg.l ⁻¹ as N	N	5.1	3.0	2.3
INORG-L12	Ammonia	mg.l ⁻¹ as NH ₄	A	3.3	0.12	0.08
INORG-L13	Chloride	mg.l ⁻¹	A	38.3	55.0	13.1
INORG-L14	Nitrite	mg.l ⁻¹ as NO ₂	A	0.20	0.003	<0.003
INORG-L06.1	BOD	mg.l ⁻¹ as O ₂	A	5.7	<0.4	<0.4
INORG-L05	COD	mg.l ⁻¹ as O ₂	A	34	20	21
INORG-L10	Total Suspended Solids	mg.l ⁻¹	A	13.6	6.0	6.4
1455	Cadmium	µg.l ⁻¹	S-A	<0.11	<0.11	<0.11
METALS-L	Aluminium	µg.l ⁻¹	A	37.4	47.6	54.0
METALS-L	Phosphate total	mg.l ⁻¹	A	<0.2	<0.2	<0.2
1455	Mercury	µg.l ⁻¹	S-A	<0.05	<0.05	<0.05

Code	Determinand	Units	*	Sample Identification		
Laboratory Sample Number:				011223006	-	-
Client Sample Reference:				DP-DS-WWTW	-	-
Sample Date & Time:				01/12/2023	-	-
Sample Matrix:				Surface Water	-	-
INORG-L11	Total Oxidised Nitrogen	mg.l ⁻¹ as N	A	1.9	-	-
INORG-L24	Total Nitrogen	mg.l ⁻¹ as N	N	1.9	-	-
INORG-L12	Ammonia	mg.l ⁻¹ as NH ₄	A	0.04	-	-
INORG-L13	Chloride	mg.l ⁻¹	A	13.4	-	-
INORG-L14	Nitrite	mg.l ⁻¹ as NO ₂	A	0.003	-	-
INORG-L06.1	BOD	mg.l ⁻¹ as O ₂	A	<0.4	-	-
INORG-L05	COD	mg.l ⁻¹ as O ₂	A	21	-	-
INORG-L10	Total Suspended Solids	mg.l ⁻¹	A	4.8	-	-
1455	Cadmium	µg.l ⁻¹	S-A	<0.11	-	-
METALS-L	Aluminium	µg.l ⁻¹	A	52.0	-	-
METALS-L	Phosphate total	mg.l ⁻¹	A	<0.2	-	-
1455	Mercury	µg.l ⁻¹	S-A	<0.05	-	-

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Analytical Method	Method Code	Accreditation Status
Determination of Metals in water by ICP-MS (Sub-contracted method)	1455	ISO/IEC 17025
Determination of COD in waters by colorimetric photometer (In-house method)	INORG-L05	ISO/IEC 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO/IEC 17025
Determination of suspended solids in water by gravimetric analysis (In-house method)	INORG-L10	ISO/IEC 17025
Determination of Nitrate in water by discrete analyser (In-house method)	INORG-L11	ISO/IEC 17025
Determination of ammonia in waters by Discrete Analyser (In-house method)	INORG-L12	ISO/IEC 17025
Determination of Chloride in water by Discrete Analyser (In-house method)	INORG-L13	ISO/IEC 17025
Determination of Nitrite in water by Discrete Analyser (In-house method)	INORG-L14	ISO/IEC 17025
Determination of Total oxidised nitrogen in Discrete Analyser Photometer (In-house method)	INORG-L11	ISO/IEC 17025
Determination of Total hardness in water by Calculation (In-house method)	METALS-L	ISO/IEC 17025
Determination of Total Nitrogen by calculation (In-house method)	INORG-L24	None
Determination of metals in waters by ICP-OES (In-house method)	METALS-L	ISO/IEC 17025

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Key and Comments:

Any comments or interpretations made by Decus Research Ltd are beyond the scope of UKAS accreditation.
Microbiological water samples will be disposed of upon completion of testing.
Chemistry water samples will be retained for a period of two weeks following the date of the issued certificate.
Chemistry soil samples will be retained for a period of one month following the date of the issued certificate.
All results only relate to the items tested as received.
This report supersedes any previous versions issued by the laboratory.
A full list of determinants relating to abbreviations such as PAHs, VOCs, SVOCs, PCBs etc. is available upon request.
Where results have been labelled as deviating for any reason, the data may not be representative of the sample at the point of sampling:

- [I/S]: Insufficient Sample.
- [U/S]: Unsuitable Sample.
- [A]: Date of Sampling not supplied.
- [B]: Sample tested outside the recommended stability times, results may be compromised.
- [C]: Samples not received in appropriate containers, results may be compromised.
- [D]: Broken Container, results may be compromised.
- [T]: Transportation storage temperature is outside the recommended range, results maybe compromised.
- [H]: High levels of non-target bacterial growth present which could have suppressed the growth of the target species.
- [M]: Media quality control failure, results may be compromised.
- [I]: Correct incubation conditions not achieved, results may be compromised.

< "Less Than"

> "Greater Than"

cfu "colony forming units"

Where any sub-contracted results have been noted as deviating by the laboratory in question, their deviation codes will be applied and detailed.

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*****END OF REPORT*****

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Certificate of Analysis Number: 7215

Project/Site name:	
Quotation Number:	DS231105
Order Number:	-
Sample Matrix:	Surface Water, Effluent

Samples Taken:	30/11/2023
Samples Received:	30/11/2023
Date Instructed:	30/11/2023
Analysis Complete:	06/12/2023
Report Issued:	13/12/2023
Sampled By:	A Bowen / M Swift

Amendment Records:
None



4303

Approved by: Adam Whitehouse

Signature:

Title: Laboratory Manager

Code	Determinand	Units	*	Sample Identification		
Laboratory Sample Number:				301123004	301123005	301123006
Client Sample Reference:				DP - Effluent	DP - 10m (Up)	DP - Downstream
Sample Date & Time:				30/11/2023	30/11/2023	30/11/2023
Sample Matrix:				Effluent	Surface Water	Surface Water
INORG-L11	Total Oxidised Nitrogen	mg.l ⁻¹ as N	A	3.4	1.9	1.9
INORG-L24	Total Nitrogen	mg.l ⁻¹ as N	N	4.3	2.0	1.9
INORG-L12	Ammonia	mg.l ⁻¹ as NH ₄	A	1.2	0.12	0.04
INORG-L13	Chloride	mg.l ⁻¹	A	37.2	19.9	13.4
INORG-L14	Nitrite	mg.l ⁻¹ as NO ₂	A	0.14	0.007	0.010
INORG-L06.1	BOD	mg.l ⁻¹ as O ₂	A	4.5	<0.4	0.7
INORG-L05	COD	mg.l ⁻¹ as O ₂	A	17	18	25
INORG-L10	Total Suspended Solids	mg.l ⁻¹	A	3.6	13.2	4.8
1455	Cadmium	µg.l ⁻¹	S-A	<0.11	<0.11	<0.11
METALS-L	Aluminium	µg.l ⁻¹	A	55.4	62.2	21.2
INORG-L21	Ortho Phosphate	mg.l ⁻¹	A	<0.02	<0.02	<0.02
1455	Mercury	µg.l ⁻¹	S-A	<0.05	<0.05	<0.05

Code	Determinand	Units	*	Sample Identification		
Laboratory Sample Number:				301123007	-	-
Client Sample Reference:				DP-DS-WWTW	-	-
Sample Date & Time:				30/11/2023	-	-
Sample Matrix:				Surface Water	-	-
INORG-L11	Total Oxidised Nitrogen	mg.l ⁻¹ as N	A	1.9	-	-
INORG-L24	Total Nitrogen	mg.l ⁻¹ as N	N	1.9	-	-
INORG-L12	Ammonia	mg.l ⁻¹ as NH ₄	A	0.03	-	-
INORG-L13	Chloride	mg.l ⁻¹	A	13.4	-	-
INORG-L14	Nitrite	mg.l ⁻¹ as NO ₂	A	0.010	-	-
INORG-L06.1	BOD	mg.l ⁻¹ as O ₂	A	<0.4	-	-
INORG-L05	COD	mg.l ⁻¹ as O ₂	A	22	-	-
INORG-L10	Total Suspended Solids	mg.l ⁻¹	A	11.6	-	-
1455	Cadmium	µg.l ⁻¹	S-A	<0.11	-	-
METALS-L	Aluminium	µg.l ⁻¹	A	69.4	-	-
INORG-L21	Ortho Phosphate	mg.l ⁻¹	A	<0.02	-	-
1455	Mercury	µg.l ⁻¹	S-A	<0.05	-	-

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Analytical Method	Method Code	Accreditation Status
Determination of Metals in water by ICP-MS (Sub-contracted method)	1455	ISO/IEC 17025
Determination of COD in waters by colorimetric photometer (In-house method)	INORG-L05	ISO/IEC 17025
Determination of BOD in water by 5 day incubation and titration (In-house method)	INORG-L06.1	ISO/IEC 17025
Determination of suspended solids in water by gravimetric analysis (In-house method)	INORG-L10	ISO/IEC 17025
Determination of Nitrate in water by discrete analyser (In-house method)	INORG-L11	ISO/IEC 17025
Determination of ammonia in waters by Discrete Analyser (In-house method)	INORG-L12	ISO/IEC 17025
Determination of Chloride in water by Discrete Analyser (In-house method)	INORG-L13	ISO/IEC 17025
Determination of Nitrite in water by Discrete Analyser (In-house method)	INORG-L14	ISO/IEC 17025
Determination of Total oxidised nitrogen in Discrete Analyser Photometer (In-house method)	INORG-L11	ISO/IEC 17025
Determination of ortho phosphate in Discrete Analyser Photometer (In-house method)	INORG-L21	ISO/IEC 17025
Determination of Total Nitrogen by calculation (In-house method)	INORG-L24	None
Determination of metals in waters by ICP-OES (In-house method)	METALS-L	ISO/IEC 17025

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Key and Comments:

Any comments or interpretations made by Decus Research Ltd are beyond the scope of UKAS accreditation.
Microbiological water samples will be disposed of upon completion of testing.
Chemistry water samples will be retained for a period of two weeks following the date of the issued certificate.
Chemistry soil samples will be retained for a period of one month following the date of the issued certificate.
All results only relate to the items tested as received.
This report supersedes any previous versions issued by the laboratory.
A full list of determinants relating to abbreviations such as PAHs, VOCs, SVOCs, PCBs etc. is available upon request.
Where results have been labelled as deviating for any reason, the data may not be representative of the sample at the point of sampling:

- [I/S]: Insufficient Sample.
- [U/S]: Unsuitable Sample.
- [A]: Date of Sampling not supplied.
- [B]: Sample tested outside the recommended stability times, results may be compromised.
- [C]: Samples not received in appropriate containers, results may be compromised.
- [D]: Broken Container, results may be compromised.
- [T]: Transportation storage temperature is outside the recommended range, results maybe compromised.
- [H]: High levels of non-target bacterial growth present which could have suppressed the growth of the target species.
- [M]: Media quality control failure, results may be compromised.
- [I]: Correct incubation conditions not achieved, results may be compromised.

< "Less Than"
> "Greater Than"

cfu "colony forming units"

Where any sub-contracted results have been noted as deviating by the laboratory in question, their deviation codes will be applied and detailed.
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