Interim River Water Quality Report

2016 – 2020 Data

Environmental Protection Unit
environmentalprotection@gov.im
March 2021

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Abbreviation	**Description**
ASPT	Average score per taxon
BMWP	Biological Monitoring Working Group
BOD	Biochemical Oxygen Demand
d/s	Downstream
DEFA	Department of Environment, Food and Agriculture
Department	DEFA
DoI	Department of Infrastructure
E&I	Environment & Infrastructure
EPU	Environmental Protection Unit
EQI	Ecological Quality Indices
EQR	Environmental Quality Ratio
EU	European Union
GQA	General Quality Assessment
IRBC	Integrated Rotating Biological Contractor
IRIS	Integrated Regional Sewage Infrastructure
MU	Manx Utilities
NTAXA	Number of taxa present per site
RICT	River Invertebrate Classification Tool
RIVPACS	River Invertebrate Prediction Accreditation System
UKAS	United Kingdom Accreditation Scheme
u/s	Upstream
WFD	Water Framework Directive (2000/60/EC)

1. Executive Summary

Overall the health of the Isle of Man's watercourse is of good status with 98% of monitored sites achieving **'Excellent'** chemical classification (Table 1). For nutrient classifications 94% and 83% of sites achieved **'Excellent'** or **'Good'** classification for phosphate and nitrate, respectively (Table 1).

For dissolved copper, nickel and iron all 13 sites monitored **passed** the standard (Table 2). Whilst, for dissolved cadmium and manganese concentrations 77% and 92 %, respectively, of sites **passed**. The primary exception reported is the dissolved zinc, whereby 92% of the sites **failed** the standard.

Table 1. Percentage of Isle of Man rivers (by length) ranked by grade (full review in Section 6 and 7)

IoM Scheme Grades	Chemistry	Phosphate	Nitrate	Biology
Excellent	98	83	52	Data to be assessed against IoM specific model (see section 5)
Good	2	11	31	
Moderate	0	6	17	
Poor	0	0	0	

Table 2. Percentage of the metal monitored sites which passed the new Environmental Quality Standards (full review in Section 8)

	Dissolved Cadmium	Dissolved Copper	Dissolved Manganese	Dissolved Nickel	Dissolved Zinc	Dissolved Iron
Pass	77	100	92	100	8	100
Fail	23	0	8	0	92	0

2. Introduction

The Environmental Protection Unit undertakes monitoring at 87 sites in the spring, summer and autumn for the Isle of Man's rivers and streams. For all sites, monitoring includes chemical water sampling and additional biological invertebrate sampling at a reduced number of the 87 sites.

The Isle of Man has recently approved the Water Pollution (Standards and Objectives) Scheme 2020 (https://www.tynwald.org.im/business/opqp/sittings/20182021/2020-SD-0537.pdf) which includes updated water quality classifications for inland waters. The classifications for chemical and nutrient assessments have been updated in accordance with the classifications outlined by the European Union (EU) Water Framework Directive as implemented by the United Kingdom (UK) to assess chemical water quality. This updated scheme has replaced the use of the General Quality Assessment (GQA) (Environment Agency, 1996) by the Isle of Man for assessing inland water quality. The GQA was originally used by England, Wales and Northern Ireland before the EU Water Framework Directive (European Commission, 2000) was implemented in 2010.

For this interim report the updated classifications as detailed in the Water Pollution (Standards and Objectives) Scheme 2020 have been used to conduct the assessments.

3. Rivers of the Isle of Man

For the purpose of presenting the classifications within this report the Isle of Man is split into four regions; North, East, South and West (Table 3). The Northern region can be split into two geographically distinct areas; the first being the Sulby river catchment which drains the slopes of the islands mountain (Snaefell, 2037 ft.), through Sulby reservoir. The second being the flat Northern plain dominated by arable farming, which has slow flowing watercourses similar to dykes and ditches. Plus, the Eastern region has significant urban and industrial areas with a relatively large number of private sewage treatment works in rural areas. The streams in Laxey, on the East coast, are impacted by disused mining sites. The Southern region is dominated by livestock and agriculture. And, the Western region is dominated by the River Neb, of which a tributary, the Foxdale Stream is impacted by disused mining sites.

Table 3. Catchment details including number of sampling sites

Region	Catchment	Sampling Sites
East	Glass (incl. Baldwin River and Sulby Stream)	8
	Dhoo (incl. Greeba)	7
	Laxey (incl. Glen Roy)	4
	Groudle (incl. Baroose Stream)	3
	Middle	4
	Baldrine	1
	Port Jack	1
	Summerhill	1
South	Colby	2
	Santonburn	4
	Silverburn (incl. Awin Ruy)	5
	Poylvaaish	1

	Ballabeg	1
	Glashen	1
	Crogga	3
	Coitt-ny-Greiney	2
	Port Erin	1
	Port Grenaugh	1
West	Neb (incl. Foxdale)	11
	Glen Maye	2
	Mooar	1
	Kirk Michael	1
	Ballaugh	1
North	Lhen	3
	Auldyn	3
	Sulby (incl. Ballakerka, Ballamenaugh, Block Eary and Lhergyhenny)	12
	Dhoon	1
	Cornaa	2

As part of the development of the Water Pollution (Standards and Objectives) Scheme 2020 all of the routine monitoring sites have been reviewed. Some sites have been removed or adjusted upstream/downstream to reflect sampling undertaken by the Inland Fisheries Division of Department of Environment, Food and Agriculture (DEFA). The reason for the changes are to enable the water quality data collected by the Environmental Protection Unit to be used to assist fisheries when interpreting their salmonid data. EPU monitor at 14 sites which are sampled as part of the salmonid monitoring programme. The remainder of the sampling points were chosen in consideration of known discharges and locations of confluences.

Figures 1 - 4 detail the location of all 87 sampling sites which are monitored throughout the year for either chemical (pink) or biological (yellow) data depending on the site. The individual maps for each split region, North, East, South and West have been provided (Figures 1-4). A list of the site names for each site code are detailed in Appendix 1 – List of all sampling sites (codes and names).

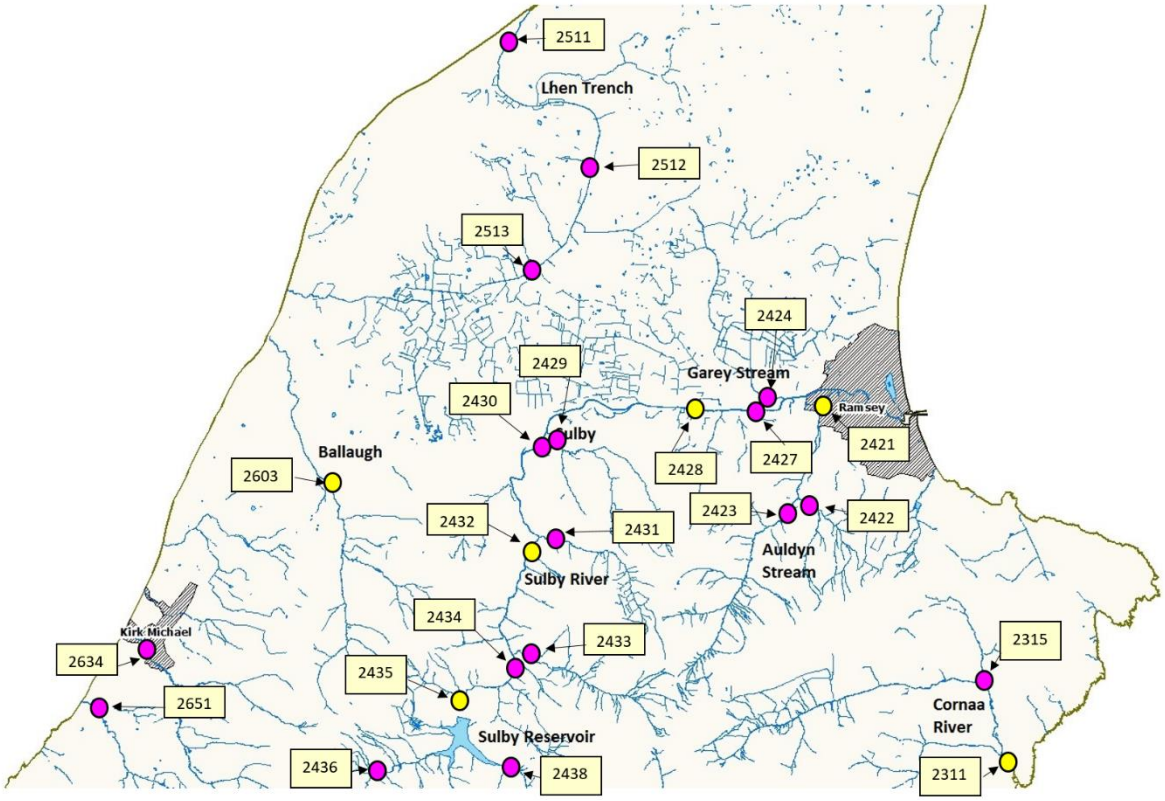

Figure 1. Northern sampling sites - locations and ID codes (chemical analysis (pink) or biological analysis (yellow))

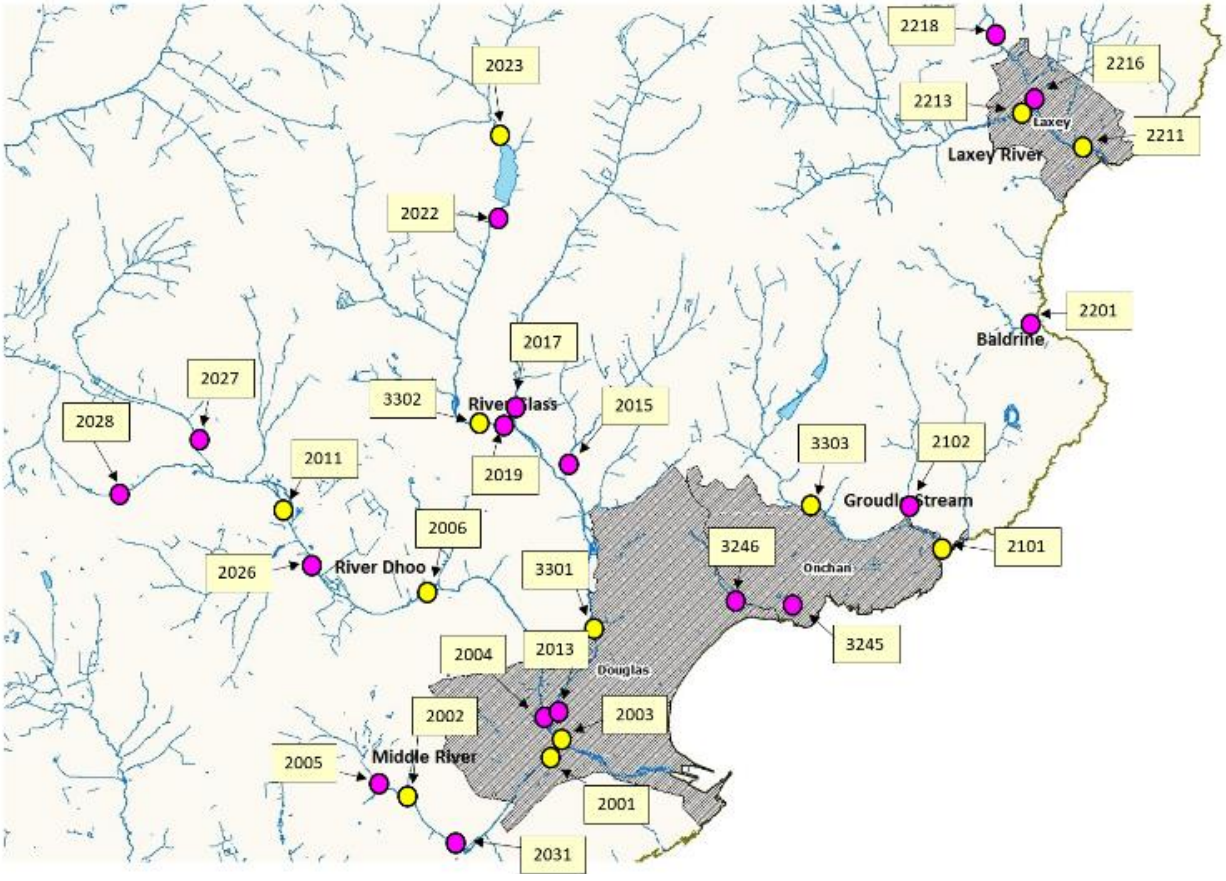

Figure 2. Eastern sampling sites - locations and ID codes (chemical analysis (pink) or biological analysis (yellow))

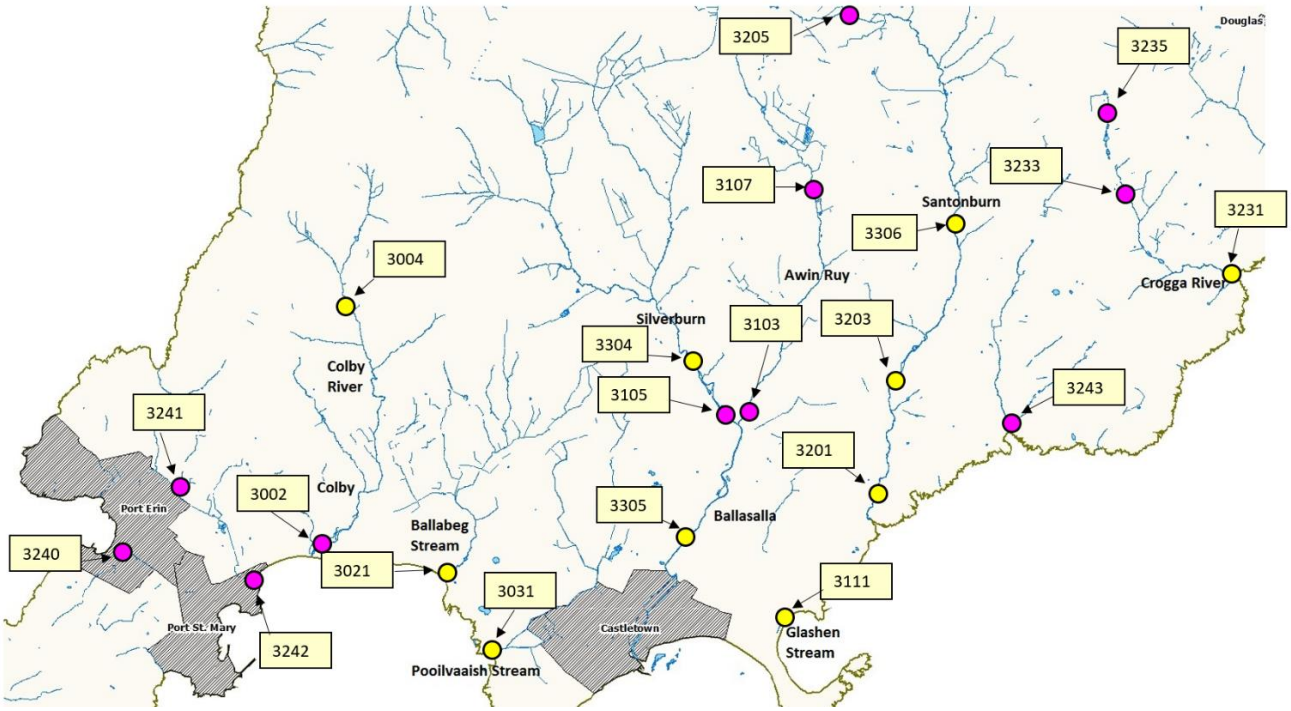

Figure 3. Southern sampling sites - locations and ID codes (chemical analysis (pink) or biological analysis (yellow))

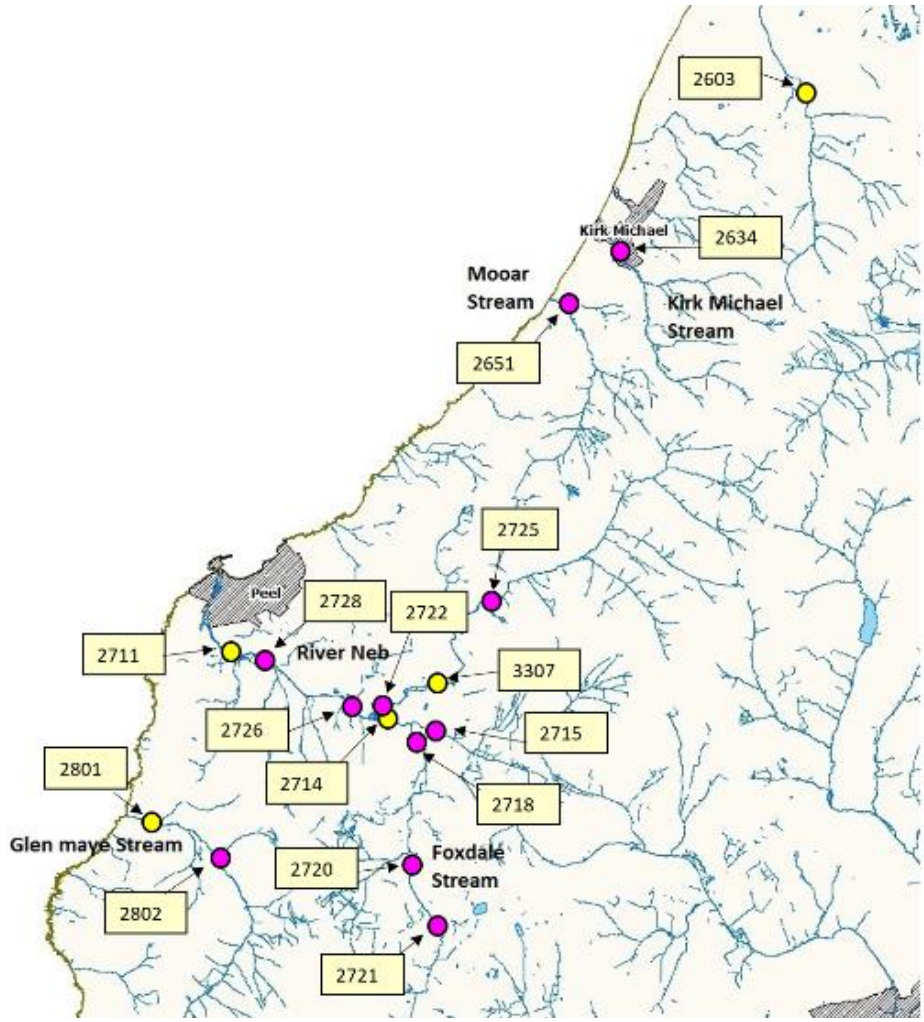

Figure 8. Western sampling sites - locations and ID codes (chemical analysis (pink) or biological analysis (yellow))

4. Water Pollution (Standards and Objectives) Scheme 2020

In December 2020, DEFA presented the Water Pollution (Standards and Objectives) Scheme 20020 to Tynwald for approval under provisions in Section 2 of the Water Pollution Act 1993. Tynwald approved the scheme and came into effect on the 31st December 2020.

Within the scheme there are inland and coastal water Environmental Quality Standards (EQS) which detail maximum concentrations or annual averages of a specific parameter to ensure the protection of the receiving waterbody. These standards are in line with the UK and EU and have been recommended to DEFA by external consultants APEM Ltd.

Classifications for the interpretation of the inland waters routine monitoring data has been updated in line with the UK. The Isle of Man previously used the General Quality Assessment (GQA) which was also used by England, Wales and Northern Ireland before the EU Water Framework Directive (European Commission, 2000) was implemented in 2010. The GQA was used to provide classification for chemical and nutrient status. Tables 4 and 5 show the difference in the classification boundaries between the GQA and Water Pollution (Standards and Objectives) Scheme 2020.

Table 4. Chemical classification comparison between GQA and IoM Scheme

Grades		Dissolved O_2 (%)		Biochemical Oxygen Demand (BOD) (mg/L)		Ammonia (mg/L)	
GQA	IoM Scheme	GQA	IoM Scheme	GQA	IoM Scheme	GQA	IoM Scheme
A	Excellent	80	>80	2.5	≤3	0.25	≤0.2
B	Good	70	75 - <80	4	>3 – 4	0.6	>0.2 – 0.3
C	Moderate	60	64 - <75	6	>4 – 6	1.3	>0.3 – 0.75
D	Poor	50	<64	8	>6	2.5	>0.75
E		20		15		9.0	
F		<20					

Table 5. Nutrient classification comparison between GQA and IoM Scheme

Grades		Phosphate (mg/L)		Nitrate (mg/L)	
GQA	IoM Scheme	GQA	IoM Scheme	GQA	IoM Scheme
A	Excellent	<0.02	≤0.023	<5	≤5
B	Good	>0.02 – 0.06	>0.023 – 0.046	>5 – 10	>5 – 10
C	Moderate	>0.06 – 0.1	>0.046 – 0.128	>10 - 20	>10 – 30
D	Poor	>0.1 – 0.2	>0.128	>20 - 30	
E		>0.2 – 1.0		>30 – 40	>30
F		>1.0		>40	

5. Biological Assessment

Biological classification of river status in the Isle of Man is currently based on the UK River Invertebrate Prediction and Classification System (RIVPACS, see: https://www.fba.org.uk/FBA/Public/Discoverand-Learn/Projects/RIVPACS-Reference-Sites-and-Reports.aspx). This classification system allocates each macroinvertebrate taxon a score, based on its known sensitivity to water quality. Sensitive species, which require clean, oxygen-rich water, score highly, while those that are tolerant of dirtier water and low oxygen concentrations have low scores. The scores for each taxon present at a site are calculated and used to generate two index metrics– NTAXA (number of taxa present at the site) and ASPT (average score per taxon).

The two metrics are then fed into the River Invertebrate Classification Tool (RICT, see: https://www.fba.org.uk/FBA/Public/Discover-and-Learn/Projects/RIVPACS-Reference-Sites-andReports.aspx), which determines the classification of each site. The system works by comparing the data with that from a series of reference sites known to be of a high biological quality. Using a series of non-biological readings, including altitude, distance from source, river width and river bed composition, RICT compares the invertebrates present at the survey site with what would be expected from an undisturbed site, based on its reference site database (https://www.ceh.ac.uk/services/rivpacs-reference-database), and allocates the survey site a proportional score for each metric, in which 1.00 means that the site is undisturbed and any value below this given an indication of the percentage deviation from the expected reference condition. When applied to the WFD, the classification category is derived from the percentage similarity to the theoretical undisturbed condition, known as the Ecological Quality Ratio (EQR).

The problem with applying this method to the Isle of Man is the selection of reference sites, chosen because they have been subject to minimal human disturbance; none reference the Isle of Man. The invertebrate fauna is naturally more diverse in Great Britain and Ireland than in the Isle of Man, a consequence of their larger size, greater geological diversity and fewer restrictions to dispersal. Therefore the reference sites available in the UK RIVPACS are unable to predict correctly what the expected taxon composition would be in the Isle of Man and the classifications derived using this are consequently have statistical uncertainty.

This issue can be rectified by developing a RICT system specific to the Isle of Man, based only on the invertebrates that occur naturally on the island. There is a precedent for this, as the fauna of Ireland is different to that of Great Britain, so reference sites from Northern Ireland were sampled to develop a separate RIVPACS database for Northern Ireland.

The project to develop an Isle of Man specific RICT has commenced with the first set of reference sites being collected from 28 locations during autumn 2020. Additional data sets are to be collected in spring and summer 2021 at the same 28 locations. As this project is underway, the Department has decided not to provide a summary on the biological data as the interpretations are restricted and formalisation of results will be delivered via the IoM RICT. Once the new tool has been created a comprehensive report will be produced on multiple years of invertebrate data.

6. Chemical Assessment

Using the new grading system the chemical water quality for the Isle of Man is **'Excellent'** at 98% of the monitoring sites with the remaining 2% achieving **'Good'** classification. Since 2003 the chemical status of the Isle of Man's rivers has increased significantly from only 80% achieving **'Excellent'** to now 98%. Sustaining this high level of chemical water quality is now important in protecting the Isle of Man river health.

A small section of the Santonburn and Middle River have raised concentrations of ammonia which has reduced their quality classification to **'Good'**. The increase of ammonia at the Santonburn site is due to an elevated ammonia concentration in the summer of 2018 reported at 0.761 mg/L. If this outlier result were to be removed from the assessment the average value for ammonia would reduce to 0.048 mg/L and classified as **'Excellent'**. The sampling represents a snap shot of the water quality, and is highly subjective to localised events, thus the elevated result could have been due to agricultural run-off but as this increase in ammonia has not presented in subsequent sampling results no further investigation has been necessary. The increase of ammonia in Middle River is only slight with an average concentration of 0.213 mg/L with the **'Excellent'** classification boundary being <0.2 mg/L. The 2021 monitoring data will be reviewed to see if the increase in ammonia is a continuing trend. An additional monitoring project is scheduled for Middle River during 2021 to assess the impact of the historic landfills over a couple of seasons, this will include nutrient and metal monitoring.

Table 6. Chemical quality by percentage; 2003 - 2020

Grade	Quality	2003 to 2005 River Length %	2015 to 2016 River Length %	2015 to 2017 River Length %	2015 to 2019 River Length %	2016 to 2020 River Length %
A	Excellent	80	88	95	95	98
B	Good	15	11	4	4	2
C	Moderate	3	0	1	1	0
D	Poor	1	1	0	0	0

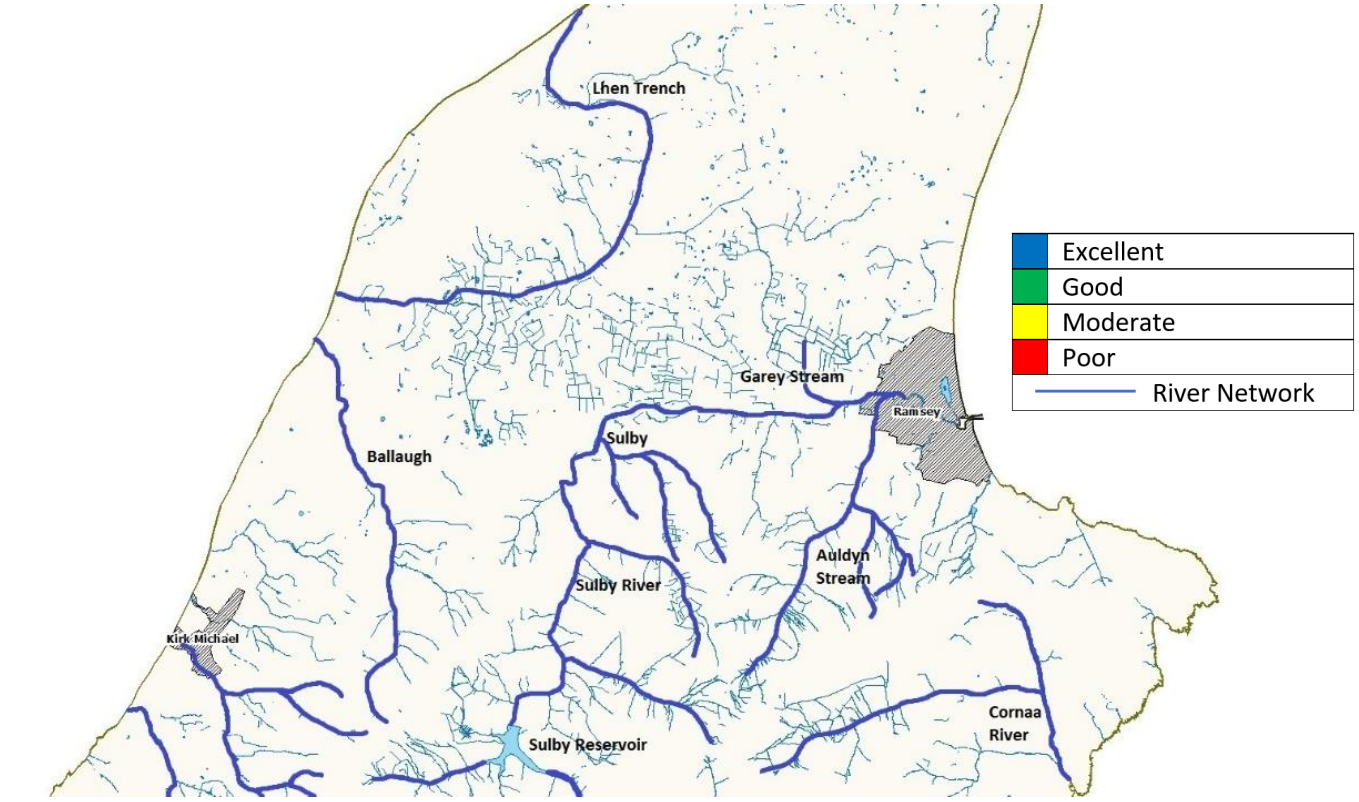

Figure 9. Chemical classification for the Northern region

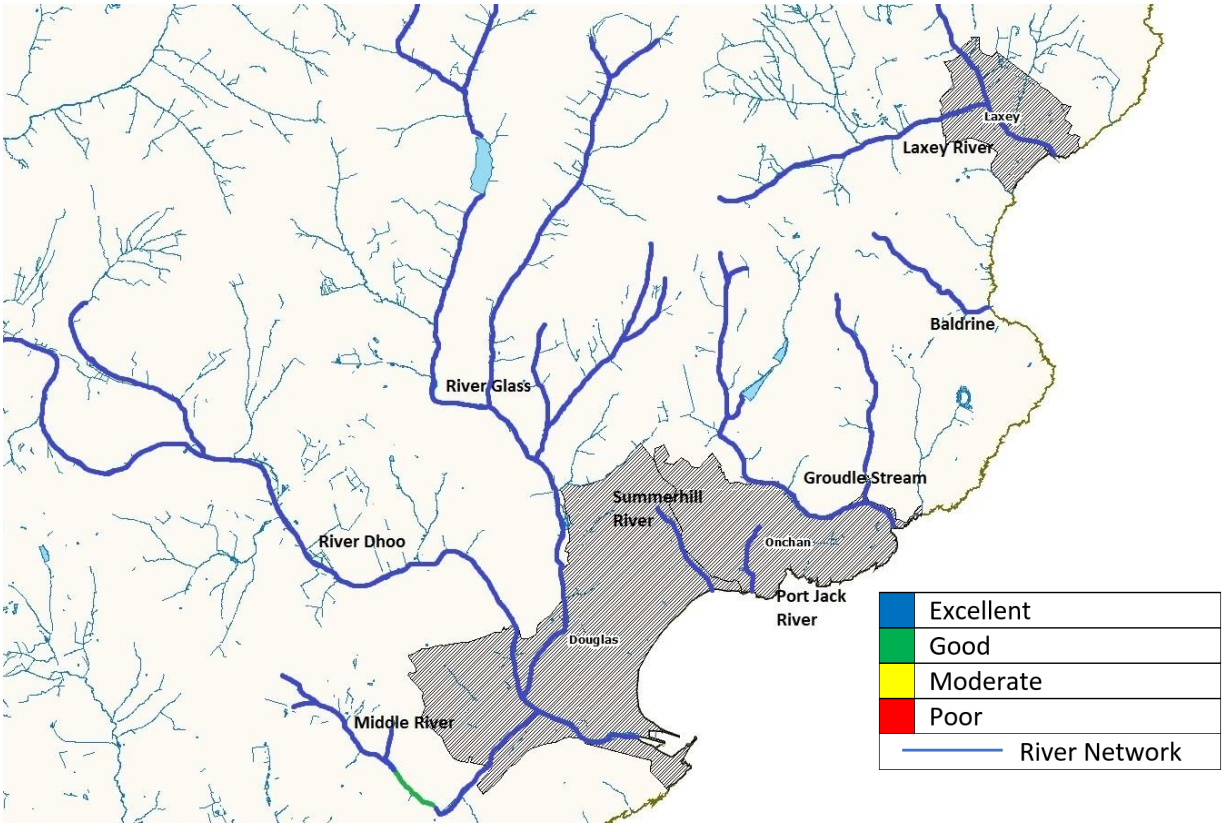

Figure 14. Chemical classification for the Eastern region

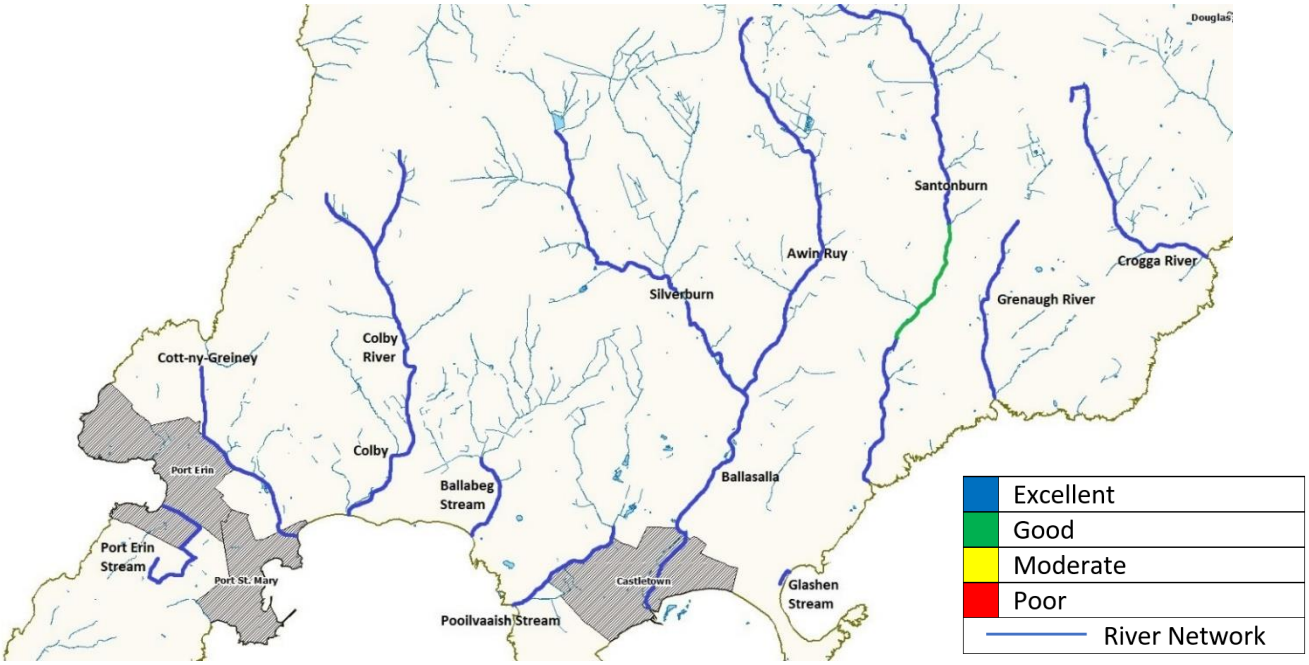

Figure 15. Chemical classification for the Southern region

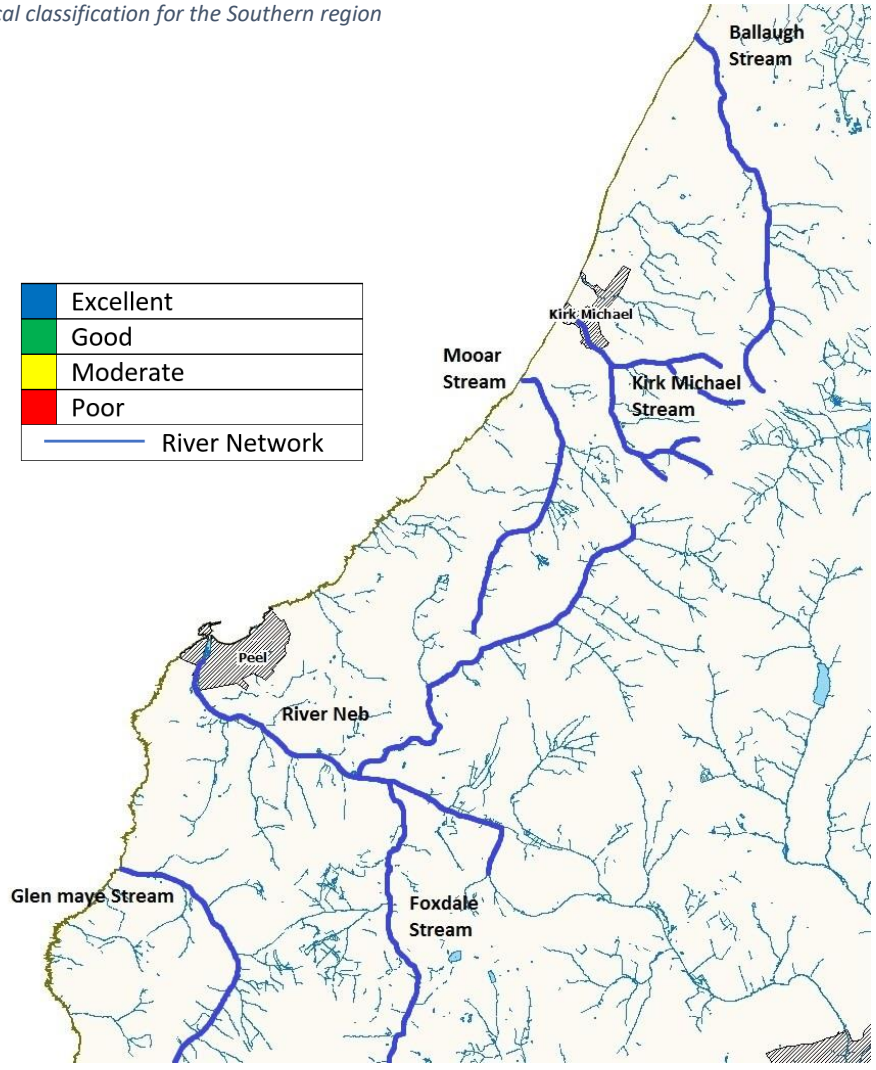

Figure 20. Chemical classification for the Western region

7. Nutrient Assessment

7.1. Phosphate

Overall, with the new grading system the percentage of **'Excellent'** and **'Good'** classified sites has remained similar for the past 5 years.

The percentage of sites achieving 'Moderate' classification has increased from 2% to 6% using the new standards. Reasons for this include areas like the upper reaches of the Cott-ny-Greiney which is typically more rural resulting in higher use of private sewage treatment works which are likely to be a primary source of phosphate to rivers along with the typical application of fertiliser to land. On the River Dhoo there are three Manx Utilities sewage treatment works for residents in Glen Vine and Crosby. The unit at Ballagarey was upgraded in 2018 to the new Integrated Rotating Biological Contractor (IRBC) units however the Crosby and Glen Vine work are scheduled to be upgraded in the next year or two. Once the work is completed the concentration of phosphate in the River Dhoo is expected to reduce, and will be reviewed annually.

In the Southern region the Ballabeg, Santonburn, Glashen and Pooilvaaish streams all achieved **'Good'** phosphate classification. These areas are all classified as rural where the use of septic tanks or private sewage treatment works is likely and it is common for the use of fertiliser to increase agricultural land yield.

'Good' classification was also achieved downstream of the Glen Maye sewage treatment works which is operated by Manx Utilities. The slightly elevated phosphate detected in the summer of 2018 at 0.098 mg/L has skewed the data and caused the lower classification. The reason for the elevated phosphate is not known but Manx Utilities regularly sample their discharges to assess compliance with their discharge license and report any issues to the Department. Samples in 2019 and 2020 are all less than the limit of detection at 0.011 mg/L and therefore no further investigations are required.

Table 7. Phosphate quality by percentage; 2003 - 2020

Grade	Quality	2003 to 2005 River Length %	2015 to 2016 River Length %	2015 to 2018 River Length %	2015 to 2019 River Length %	2016 to 2020 River Length %
A	Excellent	86	89	83	84	83
B	Good	5	9	12	13	11
C	Moderate	4	2	4	2	6
D	Poor	5	0	1	1	0

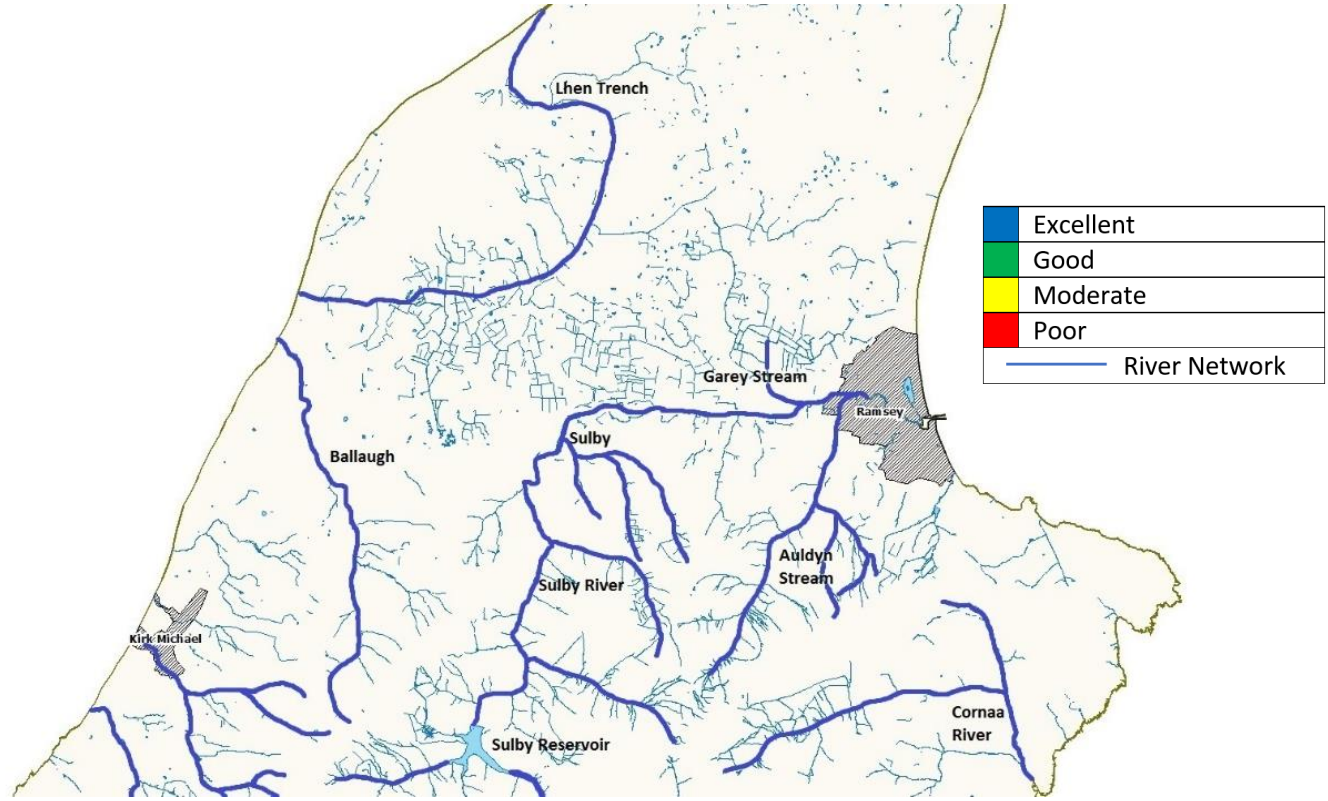

Figure 21. Phosphate classification for the Northern region

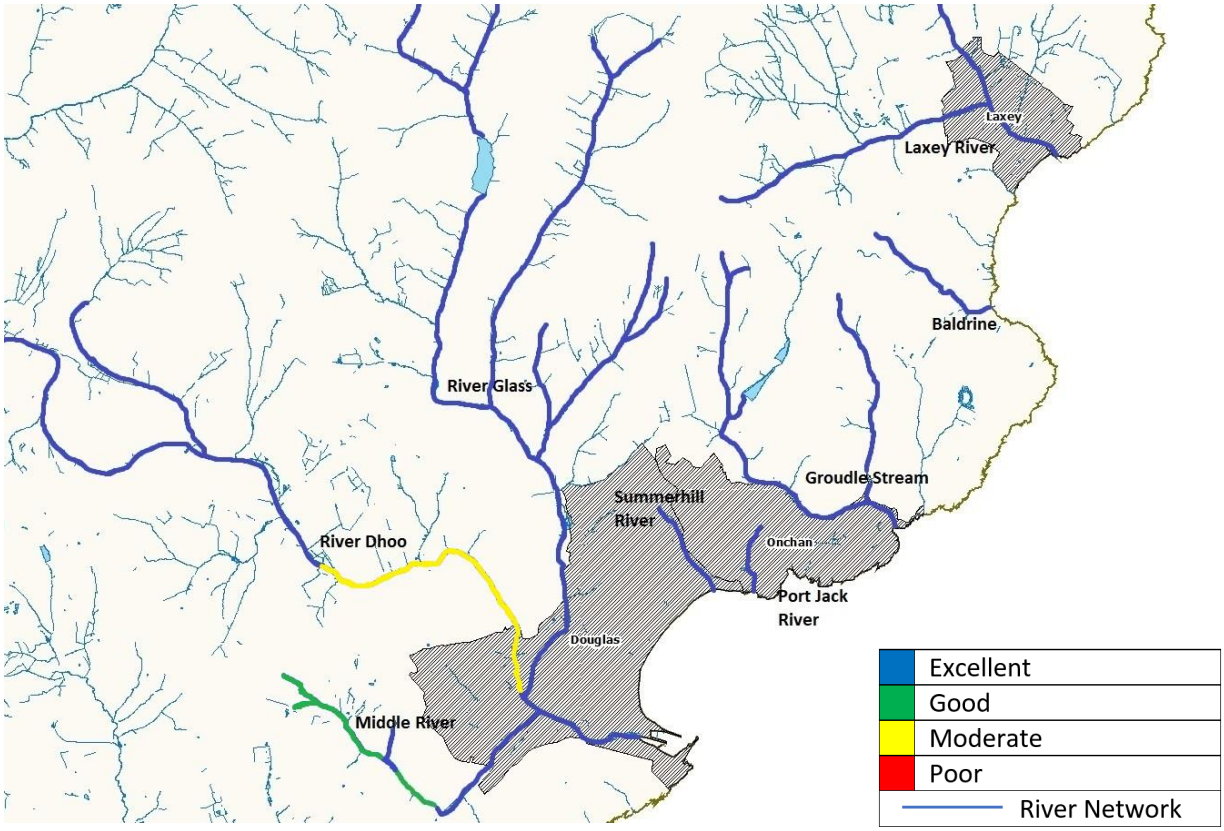

Figure 22. Phosphate classification for the Eastern region

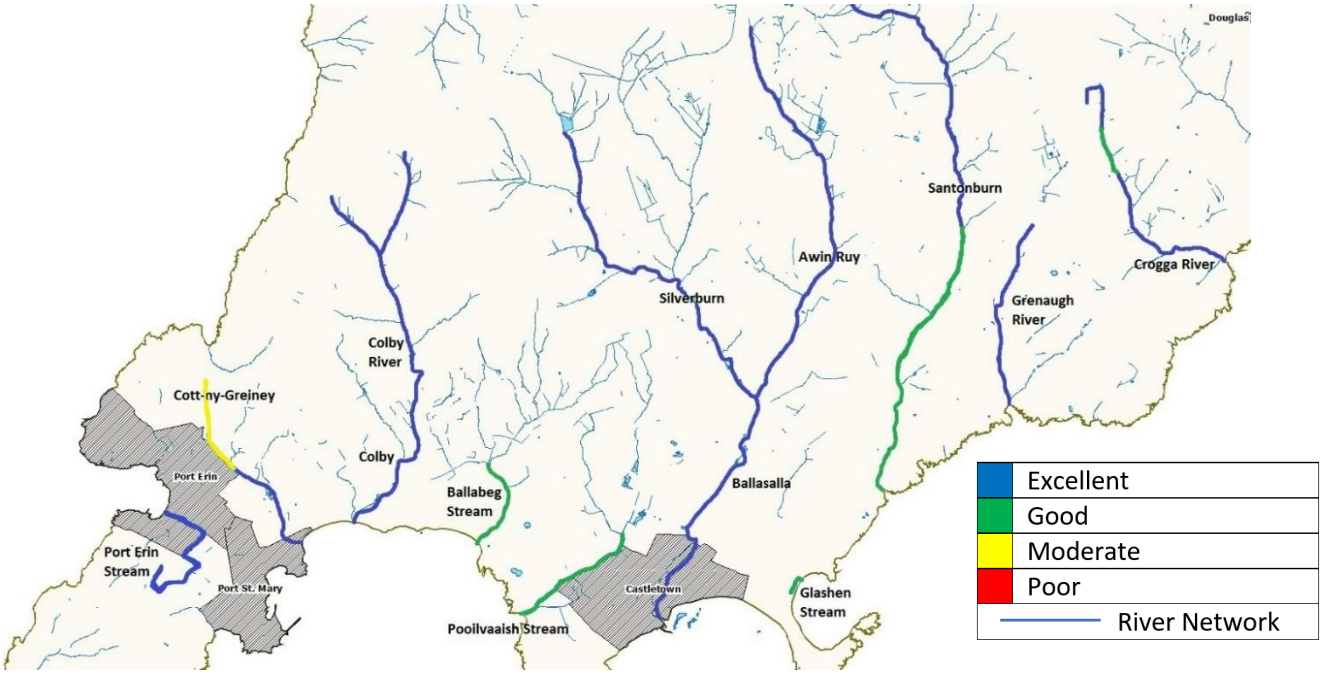

Figure 28. Phosphate classification for the Southern region

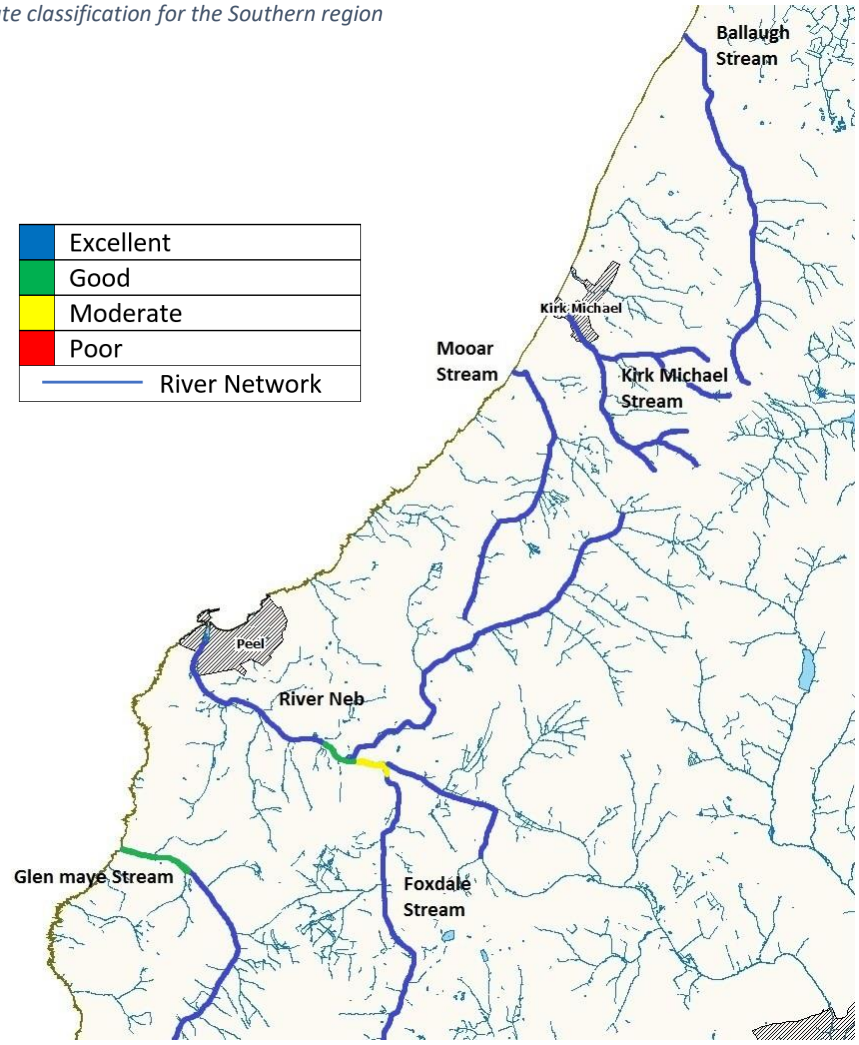

Figure 23. Phosphate classification for the Western region

7.2. Nitrate

Nitrate concentrations have been reducing over the past 17 years with 83% of rivers achieving **'Excellent'** or **'Good'** classification with the updated classifications.

In the Northern region the Lhen Trench is classified as **'Moderate'** and **'Good'** due to the increase nitrate concentration from run off of the surrounding agricultural land. The trench is used to drain the fields which regularly flood in the winter due to the high water table and high geological clay content.

The Eastern region varies in classification from **'Excellent'** status in the upper reaches of the catchment to **'Good'** or **'Moderate'** in the urban areas of Douglas and Onchan. Further investigation is required into the sources of nitrate in this region given urban areas should not be contributing significantly to nitrate concentrations. The main areas of focus with the Middle River, Port Jack stream and lower reaches of the River Dhoo which are all classified as **'Moderate'**.

The Southern region is highly agricultural so run off from the agricultural land is the likely source for the **'Moderate'** and **'Good'** classified sites. Some of the upper reaches of the rivers are classified as **'Excellent'** which is likely to be due to the limited agricultural activity due to the slope/nature of the land. The Department will initially investigate the **'Moderate'** classified rivers to reduce the concentration of nitrate entering the watercourse.

In the Western region, the concentration of nitrate is generally **'Excellent'** except for a portion of the River Neb from Peel Marina to the St John's stream where the concentration ranges from 5.15 – 7.20 mg/L. The source of this increased nitrate is likely to be due to run off from agricultural land. Future results will be monitored but the 2020 nitrate concentration have decreased to < 5.05 mg/L at all of the sites between Peel Marina and St John's stream.

Table 8. Nitrate quality by percentage; 2003 - 2020

Grade	Quality	2003 to 2005 River Length %	2015 to 2016 River Length %	2015 to 2018 River Length %	2015 to 2019 River Length %	2016 to 2020 River Length %
A	Excellent	47	54	46	47	52
B	Good	28	35	37	33	31
C	Moderate	25	11	17	20	17
D	Poor	0	0	0	0	0

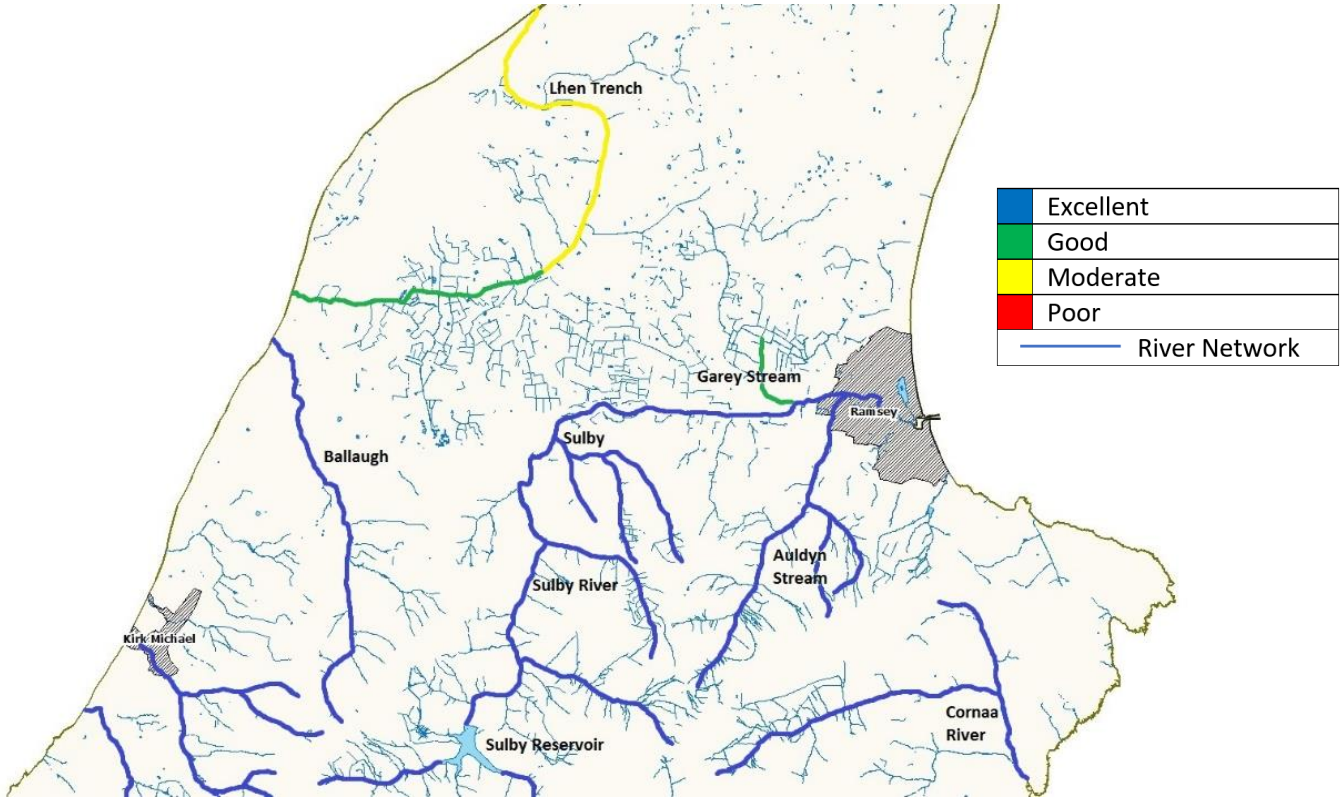

Figure 31. Nitrate classification for the Northern region

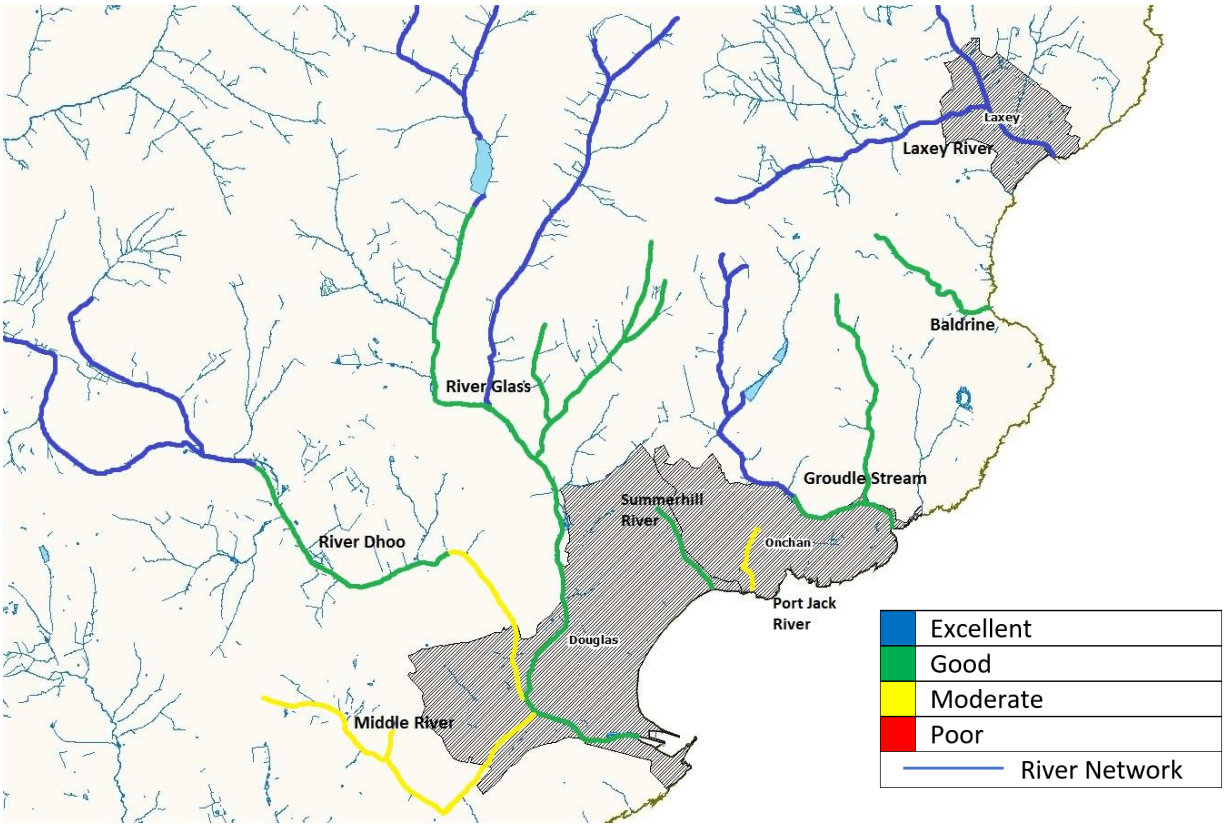

Figure 32. Nitrate classification for the Southern region

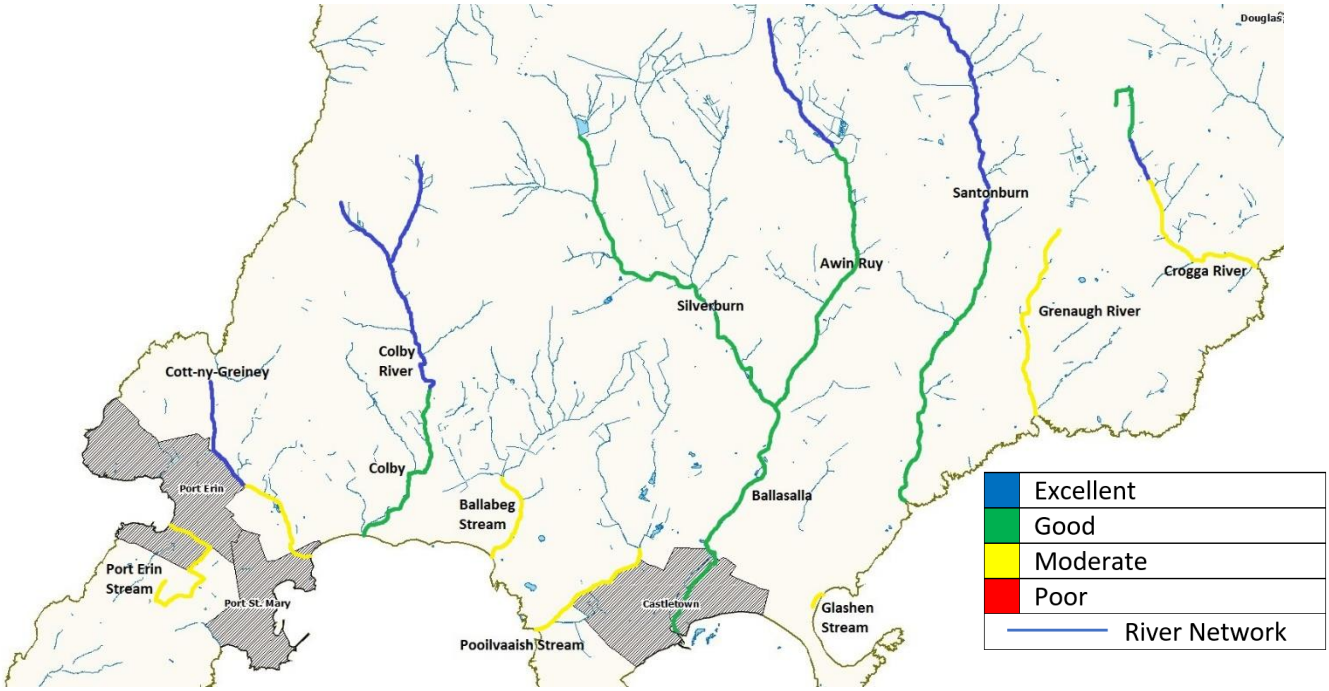

Figure 35. Nitrate classification for the Eastern region

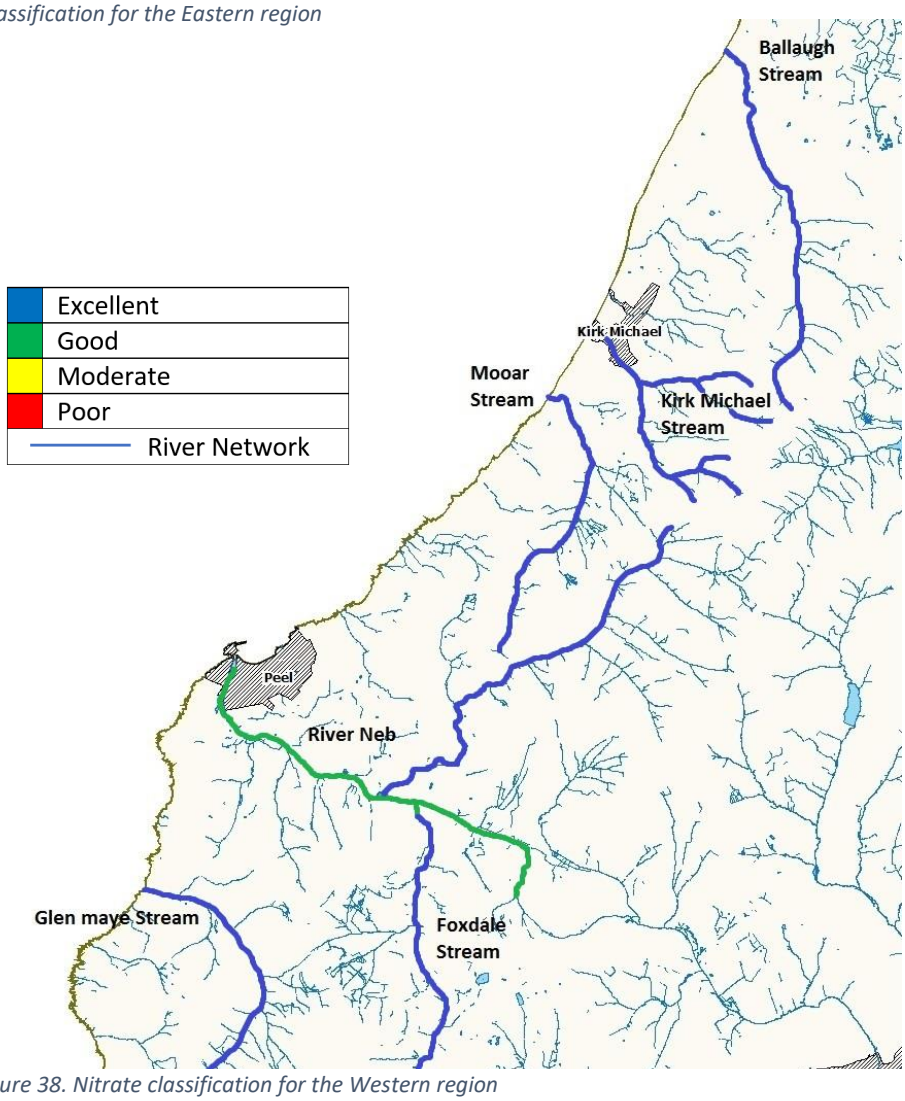

Figure 38. Nitrate classification for the Western region

8. Metal Assessment

Due to the natural geology of the Isle of Man, external consultants APEM Ltd recommended for a suite of 6 metals to be included in the routine monitoring programme at specific sites. A metal screening assessment was undertaken by EPU in March 2020 to inform the consultants on the dissolved and total metal concentrations at all 87 monitored sites. From this data, it was recommended for metals to be included in the routine suite of analysis at 13 specific sites on 8 rivers;

- Cornaa River
- Dhoon River
- Fern Glen Stream
- Foxdale Stream
- Glen Maye Stream
- Laxey River
- Lhen Trench
- Santonburn

After a couple of seasons worth of data has been collected this information will be used to inform future projects to remediate or reduce the impacts of metals on specific catchments. The criteria for the metal grades is **pass** or **fail** and the table below shows the percentage of the monitored sites to achieve each classification.

For dissolved copper, nickel and iron all sites monitored **passed** the standard. Whilst, for dissolved cadmium and manganese concentrations 77% and 92 %, respectively, of sites **passed**. The primary exception reported is the dissolved zinc, whereby 92% of the sites **failed** the standard. Due to the natural geology of the Isle of Man and the historic mining activity zinc concentrations are expected to be high in specific catchments.

As this is the first year of collecting metal monitoring data, before a full assessment can be made more data is required. This data will inform future projects seeking to reduce the concentrations of zinc and improve other parameters across the island.

Table 9. Metal classification by percentage

Classification	Dissolved Cadmium	Dissolved Copper	Dissolved Manganese	Dissolved Nickel	Dissolved Zinc	Dissolved Iron
Pass	77	100	92	100	8	100
Fail	23	0	8	0	92	0

9. Conclusions

Overall the health of the Isle of Man's watercourse is of good status with 98% of monitored sites achieving **'Excellent'** chemical classification. For nutrient classifications 94% and 83% of sites achieved **'Excellent'** or **'Good'** classification for phosphate and nitrate respectively. Though, further work is both required in these areas to reduce the concentration of all nutrients.

Nitrate concentrations have been a concern for a number of years and targeted investigations into the sources need to be undertaken to reduce the impact on the receiving watercourses. The main focus will be watercourses of **'Moderate'** classification and the data for **'Good'** classified rivers will be reviewed with the highest concentrations targeted initially.

For metal concentrations analysed in the rivers there was an average 79.5% **pass** rate. The primary exception reported was for dissolved zinc, whereby 92% of the sites **failed** the standard. Due to the natural geology of the Isle of Man and the historic mining activity zinc concentrations are expected to be high in specific catchments.

10. Further Work

- Continue with heavy metal monitoring at the agreed 13 sites to allow a full assessment of compliance with the standards and hotspots can be identified for targeted measures to reduce inputs from historic mine shafts or run off from exposed historic mine sites.
- Continue with routine monitoring programme to ensure a complete set of data for yearly classifications to be made to assess the health of the Isle of Man's rivers.
- Investigate the source of phosphate in the river stretches classified as **'Moderate'** status.
- Investigate the watercourses classified as **'Moderate'** for nitrate concentrations to reduce the levels. The Department will work with stakeholders and produce the necessary guidance document where required to reduce impacts from agricultural sources.
- Continue to collect biological and reference site data to aid the development of the Isle of Man specific River Invertebrate Classification Tool (RICT).
- Continue to monitor and mitigate against the impacts of sediment pollution from large scale developments across the island.
- Develop a screening assessment for the new standards outlined in the Water Pollution (Standards and Objectives) Scheme 2020 to assess if parameters need to be added or amended in the future.
- Targeted project on the Middle River to assess the impacts of the historic landfills which border the watercourse.

11. Appendices

11.1. Appendix 1 – List of all sampling sites (codes and names)

Site Code	River	Site Name	Region
2001	Middle River	u/s River Douglas	Eastern
2002	Middle River	Richmond Hill	
2003	River Douglas	d/s Pulrose	
2004	River Dhoo	u/s Quaterbridge	
2005	Middle River	u/s discharge	
2006	River Dhoo	Union Mills	
2011	River Dhoo	d/s Greeba confluence	
2013	River Glass	Quaterbridge	
2015	Sulby Stream	u/s River Glass	
2017	Bladwin River	u/s Glass Confluence	
2019	River Glass	u/s Baldwin Tributary	
2022	River Glass	d/s reservoir	
2023	River Glass	Injebreck	
2026	River Dhoo	u/s Glen Vine Bridge	
2027	Greeba River	Creg-y-Whuallian	
2028	River Dhoo	d/s Archallagon	
2029	River Glass	d/s dairy	
2031	Middle River	Oakhill	
2101	Groudle River	Port Groudle	
2102	Baroose Stream	u/s Footbridge	
2201	Baldrine Stream	Garwick Bay	
2211	River Laxey	Old Laxey	
2213	Glen Roy Stream	u/s River Laxey	
2216	Laxey River	u/s Glen Roy Confluence	
2218	Laxey River	u/s Mooar Confluence	
2311	Cornaa River	Port Cornaa	Northern
2315	Cornaa River	Ballaglass Glen	
2421	Glen Audlyn Stream	u/s Sulby confluence	
2422	Fern Glen Stream	u/s Glen Auldyn Stream	
2423	Glen Audlyn Stream	Glen Auldyn Arm	
2424	Garey Stream	u/s Sulby Confluence	
2427	Sulby River	Garey Weir	
2428	Sulby River	Ellenbane	
2429	Ballamenaugh Stream	u/s Sulby River	
2430	Sulby River	u/s Ballamenaugh Confluence	
2431	Ballakerka Stream	u/s Sulby Confluence	
2432	Sulby River	u/s Ballakerka Confluence	
2433	Block Eary Stream	u/s Sulby Confluence	
2434	Sulby River	u/s Block Eary Confluence	
2435	Sulby River	d/s reservoir	
2436	Sulby River	Druidale	
2438	Lhergyhenny Stream	u/s Reservoir	

2511	Lhen Trench	Cronk-ny-bing	Northern
2512	Lhen Trench	Kerrowmoar	
2513	Lhen Trench	Close-y-kewin	
2603	Ballaugh Stream	u/s Ballaugh Bridge	
2634	Kirk Michael Stream	d/s Fish Farm Abstraction	Western
2651	Mooar Stream	u/s Ford	
2711	River Neb	d/s weir & Raggatt	
2714	Foxdale Stream	u/s River Neb	
2715	St John's Stream	u/s Foxdale Stream Confluence	
2718	Foxdale Stream	u/s St John's Stream Confluence	
2720	Foxdale Stream	Lower Foxdale	
2721	Foxdale Stream	u/s Foxdale	
2722	River Neb	u/s Foxdale Stream Confluence	
2725	River Neb	Glen Helen	
2726	River Neb	u/s Ballahra	
2728	River Neb	u/s Raggatt Landfill Site	
2801	Glen Maye Stream	d/s Glen Maye	
2802	Glen Maye Stream	u/s Glen Maye	
3002	Colby River	Kentraugh	Southern
3004	Colby River	Colby Glen	
3021	Ballabeg Stream	Strandhall	
3031	Polyvaaish Stream	u/s beach	
3103	Awin Ruy	u/s Silverburn Confluence	
3105	Silverburn	u/s Awin Ruy Confluence	
3107	Awin Ruy	St Marks	
3111	Glashen Stream	Derbyheaven	
3201	Santonburn	Ballawoods	
3203	Santonburn	Ballalona	
3205	Santonburn	Tosaby	
3231	Crogga River	Port Soderick	
3233	Crogga River	d/s Bushey's Brewery	
3235	Crogga River	u/s Mount Murray	
3240	Port Erin Stream	Athol Park Glen	
3241	Cott-Ny-Greiney	Surby	
3242	Cott-Ny-Greiney	Gansey Mill	
3243	Grenaugh River	Port Grenaugh	
3244	Dhoon River	Dhoon Glen	Eastern
3245	Port Jack River	Port Jack Glen	
3246	Summerhill River	Summerhill Glen	
3301	River Glass	Tromode	
3302	River Glass	Papermill	
3303	Groudle River	Whitebridge	
3304	Silverburn	Ballamodha	Southern
3305	Silverburn	Ronaldsway Halt	
3306	Santonburn	Mullinaragher	
3307	River Neb	Tynwald Mills	Western

11.2. Appendix 2 – RAW Data (Chemical and nutrient assessment)

Site Code	Government Lab Reference	Sampling Date	Sample Temperature (°c)	pH	Conductivity (µS/cm)	BOD (mg/L)	Dissolved O_2 (%)	Dissolved O_2 (mg/L)	Alkalinity HCO_3 (mg/L)	NH_4 (mg/L)	NO_3 (mg/L)	PO_4 (mg/L)
3004	379	15/01/2016	6.1	7.78	196	<2	99.90%	12.4	23.2	<0.010	6.31	<0.07
3021	378	15/01/2016	5.9	7.52	394	3	94.40%	11.5	113	0.155	12.9	<0.07
3101	380	15/01/2016	5.1	7.63	244	<3	98.40%	12.4	58.6	0.039	8.94	<0.07
3111	377	15/01/2016	6.1	7.42	540	2	93.80%	10.7	201	0.111	8.86	<0.07
3201	425	15/01/2016	5.6	7.11	230	<2	94.50%	12.2	44	0.025	11.01	<0.07
3231	426	15/01/2016	5.6	7.16	252	<2	92.10%	11.6	41.3	0.018	11.7	<0.07
2004	422	15/01/2016	5.7	7.12	193	<5	93.70%	11.8	37.5	0.088	7.88	<0.07
2029	423	15/01/2016	6	7.25	125	<2	95.70%	11.9	17.1	<0.010	6.56	<0.07
2030	424	15/01/2016	6.1	7.25	125	<2	97.80%	12.2	16.7	0.016	6.49	<0.07
3233	583	20/01/2016	5.6	6.98	188	<2	94.20%	11.9	34.9	0.09	6.27	<0.07
3235	584	20/01/2016	5.9	6.98	167	<2	84.70%	10.6	25.6	0.091	6.59	<0.07
2002	580	20/01/2016	6.1	7.03	262	<2	91.30%	11.3	49.8	0.224	14.5	<0.07
2007	585	20/01/2016	6.5	6.94	254	<2	93.50%	11.5	40.7	0.048	14.9	<0.07
2011	581	20/01/2016	5.2	7.15	147	<2	88.80%	11.3	24	0.048	5.38	<0.07
2023	582	20/01/2016	5.5	7.31	71.9	<2	95.50%	12.1	4394	<0.010	1.72	<0.07
2001	642	21/01/2016	6.1	7.17	171	6	92.20%	11.5	41.3	0.298	6.78	<0.07
2003	643	21/01/2016	6.3	7.27	124	3	97.20%	12	19.2	0.199	6.07	<0.07
2725	784	27/01/2016	6.8	7.4	83.6	<2	92.00%	11.23	5.41	0.014	1.9	<0.07
2103	783	27/01/2016	6.1	7.2	176	<2	91.00%	11.26	26.1	0.023	6.41	<0.07
3021	3572	27/04/2016	8.6	7.56	452	2	103.00%	11.98	137	0.075	15.2	<0.07
3031	3571	27/04/2016	8.7	7.39	657	5	111.00%	12.9	269	0.027	10.8	<0.07
3101	3573	27/04/2016	9	7.78	258	<3	110.00%	12.7	62.3	0.02	8.29	<0.07
3111	3574	27/04/2016	9.1	7.52	582	5	101.00%	11.6	231	0.039	7.5	<0.07
2001	3616	28/04/2016	8.2	6.71	193	6	99.40%	11.7	44	0.155	7.32	<0.07

2003	3617	28/04/2016	8.1	6.78	152	3	103.00%	12.2	32.5	0.078	5.79	<0.07
2029	3618	28/04/2016	9.2	6.87	130	<2	108.00%	12.5	20.5	<0.010	5.98	<0.07
2030	3619	28/04/2016	9.2	6.87	131	<2	110.00%	12.6	21.4	<0.010	6.09	<0.07
3231	3714	04/05/2016	8.5	7.18	255	<2	94.90%	11.11	47.5	0.012	9.93	<0.07
3233	3715	04/05/2016	8.4	7.23	192	2	91.70%	10.76	42.5	0.025	4.17	<0.07
3235	3712	04/05/2016	8.4	7.24	272	3	94.90%	11.13	32.5	0.019	4.55	<0.07
2007	3713	04/05/2016	8.2	7.18	266	3	94.40%	11.13	48.1	0.177	12.9	<0.07
2002	3766	05/05/2016	8.6	6.88	203	2	101.00%	11.74	44.7	0.028	7.21	<0.07
2011	3767	05/05/2016	8.2	6.95	160	2	95.30%	11.23	32.3	0.045	3.55	<0.07
2026	3769	05/05/2016	8.3	6.93	178	<2	101.00%	11.83	34.9	0.12	4.44	<0.07
2023	3768	05/05/2016	8.9	7.2	68	<2	97.20%	11.26	5.54	<0.010	0.71	<0.07
2711	3795	06/05/2016	8.9	7.39	89.2	3	94.00%	10.84	9.06	0.027	1.42	<0.07
2714	3797	06/05/2016	8.8	7.22	119	<2	91.00%	10.52	18.8	<0.010	2.26	<0.07
2722	3796	06/05/2016	8.8	7.29	186	<2	90.00%	10.45	36.9		5.44	0.1
2725	3798	06/05/2016	8.9	7.44	84.2	<2	88.00%	10.14	8.12	<0.010	1.43	<0.07
2101	3962	11/05/2016	10	6.87	213	<2	94.00%	10.56	38.9	0.021	8.75	<0.07
2103	3963	11/05/2016	9.9	6.93	212	<2	95.00%	10.8	38.8	0.011	8.84	<0.07
2211	3961	11/05/2016	9.8	6.71	182	2	91.00%	10.35	36.5	0.015	5.21	<0.07
2634	4010	12/05/2016	9.9	6.64	137	<2	84.50%	9.56	25.3	<0.010	2.01	<0.07
2651	4011	12/05/2016	10	6.75	180	<2	84.80%	9.57	38.8	<0.010	3.11	<0.07
2428	4009	12/05/2016	10.1	6.7	80.3	<2	86.70%	9.76	5.76	0.017	0.59	<0.07
2435	4008	12/05/2016	10.2	6.78	81.7	<2	88.50%	9.95	6	0.017	0.58	<0.07
3004	4023	13/05/2016	10	6.47	200	7	98.50%	10.14	26.6	0.014	4.74	<0.07
3201	4024	13/05/2016	10.1	6.63	224	<2	92.00%	10.36	53.16	0.027	10.1	0.66
2423	4021	13/05/2016	9.6	6.46	90.6	6	78.50%	8.95	11.9	0.119	1.07	<0.07
2711	6778	05/08/2016	12.4	7.59	217	<2	95.10%	10.16	58.2	0.021	6.05	<0.07
2722	6777	05/08/2016	12.6	7.55	232	<2	95.10%	10.11	61.2	0.018	7.46	<0.07
2725	6776	05/08/2016	12.5	7.88	80.2	<2	96.20%	10.24	9.72	0.018	0.58	<0.07
2726	6775	05/08/2016	12.6	7.88	197	<2	97.40%	10.35	50.2	0.016	5.06	<0.07
2728	6779	05/08/2016	12.8	7.65	200	<2	98.60%	10.43	51	0.019	5.28	<0.07

2511	6902	10/08/2016	12.4	7.86	553	<2	91.00%	9.72	196	0.068	26.1	<0.07
2512	6903	10/08/2016	12.3	7.76	476	<2	88.00%	9.45	167	0.076	21.4	<0.07
2513	6904	10/08/2016	12.3	7.72	488	>7	83.00%	8.92	164	0.094	23.7	<0.07
2634	6905	10/08/2016	12.9	7.8	337	<2	94.00%	9.96	120	0.103	7.15	<0.07
2651	6906	10/08/2016	12.7	7.94	219	<2	95.00%	10.11	54.3	0.107	4.45	<0.07
2714	6907	10/08/2016	12.8	7.78	209	3	94.00%	9.94	42.9	0.361	6.3	0.3
2715	6908	10/08/2016	12.7	7.71	248	<2	97.00%	10.27	66.8	0.107	8.58	<0.07
2721	6909	10/08/2016	12.8	7.79	177	<2	96.00%	10.18	31.9	0.104	1.41	<0.07
2716	6961	11/08/2016	12.7	6.68	229	<2	90.40%	9.59	55.9	<0.010	8.96	0.14
2718	6962	11/08/2016	12.8	6.67	111	<2	93.70%	9.91	3.13	<0.010	0.84	<0.07
2720	6963	11/08/2016	12.8	6.54	111	<2	94.40%	9.99	4.36	<0.010	0.86	<0.07
2006	6964	11/08/2016	12.5	6.79	221	<2	88.30%	9.4	47.4	<0.010	9.88	0.39
2011	6965	11/08/2016	12.5	6.81	217	<2	87.70%	9.34	42.6	0.073	3.1	<0.07
2026	6966	11/08/2016	12.4	6.88	199	<2	89.10%	9.51	40.7	0.215	9.49	0.61
2027	6967	11/08/2016		6.75	168	<2		9.03	40.1	0.05	1.67	<0.07
2801	7031	12/08/2016	13.1	7.03	151	<2	90.40%	9.5	21.5	0.027	2.78	0.19
2802	7032	12/08/2016	12.9	7.1	129	<2	87.00%	9.19	16.4	<0.010	0.81	<0.07
3002	8604	05/10/2016	12.9	7.12	268	<2	94.10%	9.94	55.8	0.026	4.84	<0.07
3004	8605	05/10/2016	12.1	7.3	186	<2	94.40%	10.15	20.9	<0.010	2.8	<0.07
3021	8606	05/10/2016	13.1	8.2	506	<2	95.40%	10.03	169	0.066	7.88	0.07
3031	8607	05/10/2016	12.6	8.02	723	<2	94.60%	10.06	306	0.075	7.89	<0.07
3101	8669	06/10/2016	12.9	7.6	279	2	99.40%	10.49	56.5	<0.010	5.51	<0.07
3111	8670	06/10/2016	13.1	8.2	668	<2	97.80%	10.28	245	0.029	8.32	<0.07
2013	8704	07/10/2016	10.2	6.71	139	<2	97.00%	10.86	24.9	<0.010	5.72	<0.07
2015	8703	07/10/2016	10	6.7	127	<2	94.00%	10.56	20.2	0.05	7.37	<0.07
2019	8705	07/10/2016	10.1	6.81	102	<2	96.00%	10.78	14.8	0.01	2.95	<0.07
2029	8706	07/10/2016	10.3	6.74	133	<2	96.00%	10.81	22.8	<0.010	5.42	<0.07
2030	8707	07/10/2016	10.3	6.8	134	<2	98.00%	10.96	22.2	<0.010	5.4	<0.07
2001	9416	02/11/2016	9.1	7.1	160	<2	100.00%	11.54	30.6	0.015	6.68	<0.07
2002	9417	02/11/2016	9	7.01	260	5	93.00%	10.75	49.4	0.034	12.1	<0.07

2005	9414	02/11/2016	8.9	6.95	266	<2	94.00%	10.9	43.1	0.039	13.3	<0.07
2007	9415	02/11/2016	9	6.98	257	>9	93.70%	10.83	46.3	0.03	13	<0.07
2003	9418	02/11/2016	9.2	7.04	277	3	97.50%	11.22	56.2	0.057	12.1	<0.07
2028	9419	02/11/2016	8.7	7.11	203	<2	96.80%	11.28	45.3	0.039	7.29	<0.07
3201	9470	03/11/2016	8.7	6.67	221	9	97.00%	11.35	45.4	0.086	1.8	<0.07
3205	9471	03/11/2016	8.8	6.8	221	2	101.00%	11.68	44.6	0.088	1.81	<0.07
2016	9466	03/11/2016	9.1	6.25	68.7	<2	100.00%	11.5	5.14	0.014	0.79	<0.07
2017	9467	03/11/2016	9.1	4.69	144	<2	93.00%	10.73	0.45	<0.010	2.95	<0.07
2022	9468	03/11/2016	9	6.03	71.7	<2	101.00%	11.68	3.35	0.015	0.8	<0.07
2023	9469	03/11/2016	9	6.1	68.1	<2	102.00%	11.74	3.13	0.012	0.8	<0.07
3231	9714	10/11/2016	7.1	7.38	246	<2	98.00%	11.83	46.3	0.024	11.5	<0.07
3233	9715	10/11/2016	7.1	7.47	167	3	89.00%	10.82	28.4	0.151	5.12	<0.07
3235	9716	10/11/2016	7.1	7.33	166	3	90.00%	10.95	26.4	0.159	5.04	<0.07
2101	9710	10/11/2016	7.4	7.33	183	<2	98.00%	11.83	31.9	0.029	5.77	<0.07
2102	9711	10/11/2016	7.9	7.33	214	<2	99.00%	11.82	40.9	0.029	9.24	<0.07
2103	9712	10/11/2016	7.5	7.44	170	<2	99.00%	11.89	29.2	0.02	4.77	<0.07
2104	9713	10/11/2016	7.3	7.47	167	<2	98.00%	11.81	29.5	0.026	4.62	<0.07
3103	9820	14/11/2016	7.4	6.94	184	<2	93.00%	11.2	30.4	0.016	6.15	<0.07
3105	9821	14/11/2016	7.1	6.96	146	<2	92.00%	11.2	25.1	0.062	5.3	<0.07
3108	9819	14/11/2016	7	6.93	187	<2	91.00%	11.1	29.7	0.013	6.16	<0.07
2311	9955	16/11/2016	6.9	7.46	211	<2	91.00%	11.1	41.6	0.069	12.5	0.09
2201	9954	16/11/2016	6.9	7.44	240	<2	90.00%	10.9	47.2	0.091	11.2	<0.07
2651	10028	17/11/2016	6.8	7.23	154	<2	92.00%	11.19	27.7	<0.010	2.7	<0.07
2435	10025	17/11/2016	6.3	7.52	92.4	<2	88.00%	10.92	7.15	0.026	1.12	<0.07
2436	10026	17/11/2016	6.6	7.37	65.6	<2	92.00%	11.23	5.03	0.011	0.61	<0.07
2438	10027	17/11/2016	6.3	7.07	141	<2	89.00%	11.06	44.9	<0.010	0.87	<0.07
2315	10089	18/11/2016	7.2	7.54	202	<2	92.00%	11.1	33.2	<0.010	11.7	<0.07
2211	10090	18/11/2016	6.3	7.31	102	<2	94.00%	11.66	14.3	<0.010	3.3	<0.07
2213	10091	18/11/2016	6.5	7.35	101	<2	96.00%	11.79	14.1	<0.010	3.82	<0.07
2216	10092	18/11/2016	6.5	7.33	89.5	<2	96.00%	11.84	13	0.031	2.63	<0.07

2218	10093	18/11/2016	6.1	7.26	99.3	<2	95.00%	11.75	14	<0.010	3.3	<0.07
2428	10227	23/11/2016	6	6.63	74.6	<2	94.00%	11.71	7.15	0.032	1.07	<0.07
2429	10228	23/11/2016	5.9	6.91	107	<2	95.60%	11.95	13.2	<0.010	3.55	<0.07
2430	10229	23/11/2016	5.9	6.83	65.5	<2	95.90%	11.86	4.47	0.021	0.8	<0.07
2431	10230	23/11/2016	6	6.61	64.1	3	94.00%	11.71	4.58	0.025	0.72	<0.07
2432	10231	23/11/2016	6	6.6	64.4	<2	94.50%	11.78	3.91	0.026	0.72	<0.07
2421	10279	24/11/2016	5.9	6.44	89.4	<3	101.00%	12.66	3.69	<0.010	1.59	<0.07
2422	10280	24/11/2016	5.9	6.38	69.8	<3	99.80%	12.56	2.91	<0.010	1.3	<0.07
2423	10281	24/11/2016	5.9	6.6	107	<3	99.50%	12.52	11.9	0.011	3.86	<0.07
2433	10282	24/11/2016	5.9	6.73	111	<3	101.00%	12.58	8.38	<0.010	3.72	<0.07
2434	10283	24/11/2016	6.1	6.75	109	<3	103.00%	12.77	14.1	0.02	2.11	<0.07
3004	495	17/01/2018	5	7.28	195	<2	95.00%	12.1	23.8	<0.010	8.46	<0.07
3021	496	17/01/2018	5.5	7.55	455	3	94.00%	11.92	144	0.18	21.4	0.1
3031	494	17/01/2018	4.9	7.67	693	3	89.00%	11.46	301	0.163	18.4	0.11
3101	493	17/01/2018	5.1	7.58	263	<2	92.00%	11.73	64.4	0.039	11.2	<0.07
3111	497	17/01/2018	7.7	7.69	609	3	95.00%	11.32	239	0.084	14.6	<0.07
3201	498	17/01/2018	5.2	7.7	220	3	96.00%	12.23	49	0.021	10.8	<0.07
2435	524	18/01/2018	5.6	6.19	85.4	<2	91.40%	11.5	5.1	0.018	0.94	<0.07
3231	732	24/01/2018	8	7.52	245	<2	89.00%	10.57	40.9	0.019	13.6	<0.07
3233	733	24/01/2018	7.5	7.41	187	<2	88.00%	10.52	32.7	0.078	6.87	<0.07
3235	734	24/01/2018	8	6.76	170	6	87.00%	10.36	25.6	0.067	8.59	<0.07
2711	808	25/01/2018	6.5	7.05	172	<2	101.00%	12.4	35.8	0.052	7.53	<0.07
2714	809	25/01/2018	6.5	7.01	162	3	99.10%	12.2	29.2	0.046	6.45	<0.07
2725	807	25/01/2018	5.9	6.72	95.2	3	98.30%	12.3	9.4	0.013	4.06	<0.07
2101	804	25/01/2018	6.8	7.39	186	3	100.00%	12.2	32.5	0.023	7.85	<0.07
2103	803	25/01/2018	6.6	7.21	165	<2	98.90%	12.1	30.3	0.018	5.51	<0.07
2421	805	25/01/2018	6.1	6.59	86.2	2	98.10%	12.2	5.66	0.012	3.15	<0.07
2428	806	25/01/2018	5.9	6.32	74.4	3	99.50%	12.4	5.55	0.021	2.14	<0.07
2011	826	26/01/2018	5.9	6.75	141	<2	91.20%	11.4	27.4	0.047	5.51	<0.07
2026	825	26/01/2018	5.9	6.76	149	<2	94.30%	11.5	28.4	0.112	6.31	<0.07

2023	824	26/01/2018	4.9	6.1	64.3	3	94.90%	12.2	3.4	<0.010	1.52	<0.07
2002	951	31/01/2018	6	7.37	194	<2	97.10%	12.01	37.6	0.053	10.7	<0.07
2007	950	31/01/2018	6.5	7.38	221	3	97.40%	11.98	43.8	0.079	12.3	<0.07
2029	959	01/02/2018	5.6	7.15	122	<2	94.80%	11.93	17.9	0.012	6.82	<0.07
2030	958	01/02/2018	5.5	7.18	121	<2	94.80%	11.96	18.9	0.016	6.73	<0.07
2001	1594	22/02/2018	7.1	7.35	269	<2	94.30%	11.4	58.9	0.16	12.5	<0.07
2003	1595	22/02/2018	6.1	7.29	145	<3	98.70%	12.3	25.9	0.021	7.82	<0.07
3004	3460	25/04/2018	8.5	7.28	194	<2	93.90%	10.99	25.9	<0.010	6.38	<0.07
3021	3461	25/04/2018	9	7.68	460	2	95.80%	11.08	153	0.145	16.9	0.08
3031	3462	25/04/2018	10.1	7.81	693	<2	99.10%	11.16	308	0.084	12	<0.07
3101	3463	25/04/2018	10.5	8.02	254	<2	103.00%	11.49	66.7	<0.010	8.47	<0.07
3111	3464	25/04/2018	10.9	7.75	599	<2	92.90%	10.26	240	0.037	13.5	<0.07
2029	3458	25/04/2018	10.8	7.27	125	<2	96.00%	10.58	22.6	<0.010	5.86	<0.07
2030	3459	25/04/2018	10.8	7.34	123	<2	101.00%	11.16	21.5	<0.010	5.81	<0.07
3231	3655	02/05/2018	9.1	7.5	249	<2	95.90%	11.06	52.6	0.014	11.6	<0.07
3233	3656	02/05/2018	11	7.57	185	4	98.50%	10.86	42.6	0.043	2.84	<0.07
3235	3657	02/05/2018	11.2	7.1	183	<2	99.60%	10.94	25.6	0.046	7.14	<0.07
2101	3653	02/05/2018	9.7	7.37	170	<2	100.00%	11.4	32.3	0.033	6.46	<0.07
2103	3654	02/05/2018	10.6	7.39	149	<2	98.60%	10.97	28.9	0.018	4.29	<0.07
2711	3728	03/05/2018	8.5	7.24	173	<2	100.00%	11.7	44.2	0.017	5.22	<0.07
2714	3729	03/05/2018	8.6	7.27	169	3	100.00%	11.72	37.6	0.39	4.33	<0.07
2725	3730	03/05/2018	7.9	7.52	82.7	<2	99.70%	11.85	12.7	<0.010	1.72	<0.07
2011	3731	03/05/2018	8.6	7.15	134	<2	98.10%	11.45	29.2	0.058	3.11	<0.07
2001	3921	10/05/2018	10.9	7.54	287	<2	105.00%	11.56	70.8	0.068	11.9	<0.07
2003	3922	10/05/2018	10.6	7.69	166	<2	107.00%	11.89	37	0.019	6.58	<0.07
2026	3924	10/05/2018	11.2	7.03	148	<3	115.00%	12.61	36.2	0.067	4.55	0.1
2023	3923	10/05/2018	9.8	7.12	59.3	<2	99.60%	11.3	4.42	0.017	0.58	<0.07
2421	3925	10/05/2018	8.5	7.12	65.8	<2	97.90%	11.45	7.26	0.016	1.26	<0.07
2428	3926	10/05/2018	9	7.03	97.7	<2	100.00%	11.59	12.6	0.013	2.41	<0.07
2435	3927	10/05/2018	10.1	7.13	79.6	<2	102.00%	11.53	7.03	0.025	0.39	<0.07

3201	4048	16/05/2018	11.6	7.51	228	<2	105.00%	11.43	60.5	0.014	6.34	<0.07
2002	4046	16/05/2018	10.2	7.49	269	<2	97.00%	10.91	57	0.051	12.6	<0.07
2007	4047	16/05/2018	9.8	7.37	273	<2	97.70%	11.08	62.1	0.16	12.9	<0.07
2421	5201	21/06/2018	14.6	7.71	95.6	<2	96.00%	9.72	10.2	0.021	1.45	<0.07
2424	5200	21/06/2018	13.5	7.62	433	<2	93.00%	9.65	154	0.149	9.72	<0.07
2427	5199	21/06/2018	14.1	6.74	76.3	<2	95.00%	9.74	8.17	0.035	1.35	<0.07
2428	5198	21/06/2018	14.5	6.74	71.9	<2	96.00%	9.81	7.94	0.031	1.22	<0.07
2429	5197	21/06/2018	11.9	6.56	132	<2	91.00%	9.79	23.1	0.021	3.54	<0.07
2430	5196	21/06/2018	13.9	6.65	65.2	<2	95.00%	9.78	5.45	0.03	0.87	<0.07
2431	5195	21/06/2018	11.1	6.61	85.2	<2	89.00%	9.75	10.6	0.032	0.88	<0.07
2432	5194	21/06/2018	14.1	6.67	63.1	<2	95.00%	9.72	5.33	0.034	0.78	<0.07
2433	5193	21/06/2018	12.3	6.62	69.1	<2	93.00%	9.99	6.81	<0.010	1.66	<0.07
2434	5192	21/06/2018	12.5	6.6	75.2	<2	90.00%	9.6	9.08	0.032	0.8	<0.07
2435	5191	21/06/2018	13.4	6.6	70.6	<2	91.00%	9.52	8.96	0.056	0.71	<0.07
2311	5220	22/06/2018	14.9	7.7	108	<2	93.50%	9.44	14	0.051	5.36	0.07
2315	5221	22/06/2018	11.9	7.79	75.9	<2	91.90%	9.93	9.76	0.02	1.93	<0.07
2511	5224	22/06/2018	11.7	7.39	551	<2	85.00%	9.22	191	0.017	26	<0.07
2512	5225	22/06/2018	12.5	7.49	477	<2	89.10%	9.48	154	0.056	20.8	<0.07
2513	5226	22/06/2018	12.1	7.43	350	5	81.20%	8.73	107	0.272	4.31	<0.07
2603	5227	22/06/2018	11.1	7.78	133	<2	87.00%	9.58	15.8	0.029	4.22	<0.07
2634	5228	22/06/2018	12.1	7.55	271	<2	87.90%	9.44	87.6	<0.010	5.83	<0.07
2651	5229	22/06/2018	10.9	7.69	210	<2	87.60%	9.68	52.4	0.025	4.26	<0.07
2201	5219	22/06/2018	12.1	7.5	222	<2	89.40%	9.61	48.2	<0.010	8.89	<0.07
2422	5222	22/06/2018	11.3	7.52	94.8	2	87.50%	9.59	8.96	0.011	0.72	<0.07
2423	5223	22/06/2018	12.1	7.56	74.1	<2	90.00%	9.67	6.58	<0.010	0.85	<0.07
3002	5344	27/06/2018	15.2	7.14	293	<2	91.50%	9.18	66	0.036	8.16	<0.07
3004	5349	27/06/2018	13.8	7.35	194	<2	88.20%	9.13	27	0.025	4.57	<0.07
3103	5346	27/06/2018	15.3	7.21	255	<2	89.90%	9	62.1	0.069	7.35	<0.07
3105	5347	27/06/2018	15.8	7.3	207	<2	91.00%	9.02	40.2	0.038	6.64	<0.07
3108	5348	27/06/2018	15.7	7.46	153	<2	90.80%	9.02	10.9	<0.010	2.72	<0.07

2801	5342	27/06/2018	14.2	7.29	177	<2	86.60%	8.89	31.5	0.059	4.85	0.3
2802	5343	27/06/2018	14.2	7.37	135	<2	87.10%	8.94	17.4	<0.010	1.2	<0.07
3111	5350	27/06/2018	13.6	7.87	613	<2	88.60%	9.21	244	0.06	10.8	<0.07
3203	5345	27/06/2018	16.5	7.13	279	3	91.30%	8.91	75.8	0.978	12.5	0.32
3031	5414	28/06/2018	18.9	7.83	712	<2	97.60%	9.07	307	0.062	5.75	<0.07
3101	5415	28/06/2018	18.3	8.24	301	<2	100.00%	9.43	91.7	0.026	6.45	<0.07
3107	5416	28/06/2018	17.4	8.2	170	3	89.20%	8.55	31.9	0.028	1.73	<0.07
3231	5418	28/06/2018	15.7	7.66	290	<2	89.40%	8.88	62.9	<0.010	12.3	<0.07
3233	5419	28/06/2018	17.9	7.69	235	<2	88.80%	8.42	68.6	0.05	2.26	0.18
2715	5577	04/07/2018	14.2	7.22	248	<2	91.10%	9.34	69.6	0.01	9.43	<0.07
2718	5578	04/07/2018	17	7.24	208	<2	94.90%	9.17	47	<0.010	2.54	<0.07
2720	5579	04/07/2018	15.5	7.34	251	<2	92.90%	9.26	58	0.028	1.31	<0.07
2721	5580	04/07/2018	14.3	7.63	112	<2	93.10%	9.52	7.94	0.012	0.77	<0.07
2004	5574	04/07/2018	19.4	7.27	252	<2	108.00%	9.94	61.6	0.034	12	0.2
2004	5574	04/07/2018	19.4	7.27	252	<2	108.00%	9.94	61.6	0.034	12	0.2
2006	5575	04/07/2018	16.3	7.24	231	<2	89.00%	8.72	49	0.073	16.1	0.64
2013	5576	04/07/2018	17.6	7.36	154	<2	98.30%	9.37	27.9	0.026	7.85	<0.07
2722	5625	06/07/2018	13.4	7.17	149	<2	90.00%	9.39	31.2	0.018	3.64	<0.07
2726	5626	06/07/2018	13.8	7.04	211	<2	94.00%	9.68	45	0.326	9.49	0.35
2728	5627	06/07/2018	13.4	6.99	272	<2	94.00%	9.77	78.3	0.019	10.2	0.1
2102	5624	06/07/2018	13.1	7.05	250	<2	93.00%	9.79	46.5	0.03	13.6	0.07
2711	5863	13/07/2018	13.6	6.79	271	<2	92.40%	9.64	79.2	0.129	9.38	<0.07
2714	5864	13/07/2018	13.7	6.81	264	<2	89.90%	9.32	59	0.736	14.4	0.93
2725	5865	13/07/2018	13.5	7.16	96.7	<2	94.40%	9.84	14.2	0.05	1.55	<0.07
2011	5862	13/07/2018	14.2	6.87	188	<2	81.60%	8.37	49.9	0.061	3.84	<0.07
2101	6012	18/07/2018	14.4	6.97	227	<2	91.70%	9.36	46.1	0.052	10.4	0.07
2103	6013	18/07/2018	14.1	7.04	212	<2	94.50%	9.7	44.1	0.013	7.99	0.12
2001	6007	18/07/2018	14.2	6.85	313	<2	90.70%	9.3	75.6	0.038	12.9	<0.07
2003	6008	18/07/2018	15.3	6.96	209	<2	96.20%	9.63	51.3	0.015	8.77	<0.07
2026	6009	18/07/2018	13.9	6.93	217	3	75.50%	7.79	50.9	0.165	13.2	0.71

2029	6010	18/07/2018	14.2	7.07	135	<2	91.30%	9.37	23.9	0.011	6.92	<0.07
2030	6011	18/07/2018	14.2	7.08	134	<2	90.60%	9.29	24.5	0.014	6.92	<0.07
3235	6279	25/07/2018	14	6.83	167	<2	92.00%	9.43	20.4	0.013	7.12	<0.07
2104	6270	25/07/2018	14.7	6.78	191	<2	94.00%	9.51	42.8	0.012	6.03	<0.07
2015	6271	25/07/2018	13.7	6.75	187	<2	89.00%	9.27	47.2	<0.010	5.8	<0.07
2016	6272	25/07/2018	13.8	6.87	120	<2	91.00%	9.45	18.4	0.013	6.74	<0.07
2017	6273	25/07/2018	14	6.86	120	<2	91.00%	9.37	23.3	<0.010	3.08	<0.07
2019	6274	25/07/2018	13.6	6.88	114	<2	95.00%	9.9	17	<0.010	7.4	<0.07
2022	6275	25/07/2018	14.1	7.04	69.8	<2	92.00%	9.44	8.62	0.187	0.76	<0.07
2023	6276	25/07/2018	16.3	7.07	63.4	<2	94.00%	9.21	8.96	0.075	0.63	<0.07
2024	6277	25/07/2018	14	6.89	119	<2	92.00%	9.51	18.6	0.028	6.49	<0.07
2025	6278	25/07/2018	14.2	6.78	118	<2	91.00%	9.35	19.1	0.027	6.52	<0.07
3201	6373	27/07/2018	16.5	6.9	270	<2	96.00%	9.38	71	0.022	8.15	0.15
2211	6367	27/07/2018	18.9	6.73	124	<2	103.00%	9.54	25.6	0.015	2.51	<0.07
2213	6368	27/07/2018	15.1	6.75	116	<2	94.00%	9.44	22.7	<0.010	3.03	<0.07
2216	6369	27/07/2018	17.6	6.73	113	<2	97.00%	9.3	20.7	<0.010	2.11	<0.07
2218	6370	27/07/2018	15.9	6.84	86.8	<2	95.00%	9.38	12.1	<0.010	2.32	<0.07
2031	6366	27/07/2018	15.2	6.43	327	2	95.00%	9.52	68	0.204	14.8	0.13
2027	6364	27/07/2018	13.3	6.43	193	<2	77.00%	8.04	49.5	0.083	2.55	<0.07
2028	6365	27/07/2018	12.7	6.55	149	<2	83.00%	8.78	6.92	0.037	0.14	<0.07
2436	6371	27/07/2018	14.6	6.9	81.8	<2	91.00%	9.24	16.5	<0.010	0.08	<0.07
2438	6372	27/07/2018	16.2	6.99	66	<2	94.00%	9.19	6.58	<0.010	<0.05	<0.07
2002	6980	15/08/2018	14.5	7.51	311	<2	92.50%	9.43	63.7	0.019	12.5	0.19
2005	6981	15/08/2018	14.7	7.44	276	<2	94.10%	9.54	59.3	0.023	11.1	0.23
2007	6982	15/08/2018	14.8	7.59	321	3	94.80%	10.12	62.5	0.417	13.8	0.13
2725	9350	31/10/2018	7.6	7.21	103	<2	89.00%	10.66	7.71	0.012	1.95	<0.07
2011	9352	31/10/2018	8.1	6.84	155	<2	88.90%	10.5	23.5	0.073	3.36	<0.07
3004	9425	01/11/2018	7.6	7.34	207	<2	85.50%	10.24	14.5	0.015	2.45	<0.07
3021	9426	01/11/2018	7.6	7.23	487	6	83.20%	9.91	142	1.61	8.74	0.35
3031	9427	01/11/2018	7.2	7.41	672	2	82.60%	9.99	241	0.129	8.2	<0.07

3101	9428	01/11/2018	7.8	7.93	232	<2	89.10%	10.61	43.6	0.022	6.57	<0.07
3111	9429	01/11/2018	10.1	7.6	603	3	88.80%	10	196	0.237	14.7	0.13
3231	9431	01/11/2018	8	7.56	236	2	90.90%	10.77	44.5	0.029	9.24	<0.07
3233	9430	01/11/2018	7	7.55	183	3	88.20%	10.72	40.2	0.055	4.62	<0.07
3235	9454	02/11/2018	8.9	6.93	185	<2	86.20%	9.99	25.9	<0.010	7.2	<0.07
2001	9456	02/11/2018	8.5	7.41	275	<2	89.90%	10.51	57.8	0.087	12.5	<0.07
2003	9455	02/11/2018	7.7	7.12	164	<2	88.60%	10.57	31.2	0.015	5.84	<0.07
2029	9452	02/11/2018	7.4	7.24	133	<2	88.20%	10.6	18.3	<0.010	5.21	<0.07
2030	9453	02/11/2018	7.2	7.25	127	<2	87.70%	10.6	17.8	0.012	5.19	<0.07
2002	10014	21/11/2018	8.7	6.75	238	<2	96.80%	11.28	42.1	0.044	15.1	<0.07
2023	10013	21/11/2018	6.7	6.44	62.1	<2	95.20%	11.65	4.37	<0.010	1.01	<0.07
2101	10078	22/11/2018	8	7.22	179	<2	97.70%	11.58	29.5	<0.010	7.65	<0.07
2103	10077	22/11/2018	7.9	6.61	160	<2	98.90%	11.74	26	<0.010	5.54	<0.07
2007	10079	22/11/2018	9	7.17	261	2	98.10%	11.34	48.7	0.172	16.3	<0.07
2421	10076	22/11/2018	7	6.52	81.1	<2	95.80%	11.64	4.49	<0.010	1.94	<0.07
2428	10075	22/11/2018	7.3	6.47	78.7	<2	95.80%	11.54	5.06	<0.010	2.37	<0.07
2435	10074	22/11/2018	8.8	6.38	86.7	<2	95.70%	11.12	4.49	0.029	0.89	<0.07
2711	473	17/01/2019	5.5	6.73	200	<2	92.00%	11.67	43	0.045	7.28	<0.07
2714	471	17/01/2019	5.6	6.7	189	<2	91.00%	11.44	36.6	0.271	7.39	0.21
2722	472	17/01/2019	5.4	6.88	120	<2	90.00%	11.44	16.6	0.02	3.64	<0.07
2711	2521	27/03/2019	8.4	6.75	179	<2	99.00%	11.56	38.9	0.069	6.6	<0.07
2714	2522	27/03/2019	8.7	6.83	167	<2	102.00%	11.83	30	0.02	5.58	<0.07
2725	2523	27/03/2019	8	7.07	90.8	<2	100.00%	11.81	10.2	0.017	2.76	<0.07
2011	2524	27/03/2019	9.4	6.87	139	<2	98.00%	11.26	28.1	0.048	4.33	<0.07
2026	2525	27/03/2019	9.7	6.84	148	3	101.00%	11.51	28.9	0.134	5.2	<0.07
3231	2578	28/03/2019	10.2	7.02	253	<2	104.00%	11.66	43.5	<0.010	14.9	<0.07
3233	2577	28/03/2019	10.4	6.79	187	2	102.00%	11.43	33.4	<0.010	5.19	<0.07
3235	2576	28/03/2019	10.7	6.54	162	<2	102.00%	11.33	24.5	<0.010	7.49	<0.07
2421	2575	28/03/2019	8.2	6.35	86.6	<2	98.00%	11.55	6.1	<0.010	1.58	<0.07
2428	2574	28/03/2019	7.9	6.35	81.8	<2	96.80%	11.5	7.59	<0.010	2.41	<0.07

2435	2573	28/03/2019	7.2	6.36	82.3	<2	93.30%	11.28	5.98	<0.010	1.13	<0.07
2101	2604	29/03/2019	9	7.05	187	<2	99.40%	11.49	31.8	0.065	7.77	<0.07
2023	2603	29/03/2019	7.7	6.49	68.8	<2	97.00%	11.58	3.11	0.037	0.85	<0.07
2103	2842	04/04/2019	8.1	7.11	155	<2	101.00%	11.89	28.7	0.016	4.33	<0.07
2001	2844	04/04/2019	8.8	6.97	285	2	100.00%	11.64	64.2	0.18	13.3	<0.07
2002	2845	04/04/2019	8.5	7.05	253	3	101.00%	11.8	47.4	0.22	14.8	0.1
2003	2843	04/04/2019	7.9	7.1	156	<2	103.00%	12.18	28.5	0.024	6.88	<0.07
2029	2841	04/04/2019	7.3	7.16	127	<2	98.00%	11.82	18.8	0.017	6.37	<0.07
2030	2840	04/04/2019	6.7	7.14	125	<2	96.00%	11.79	19.6	0.016	6.29	<0.07
3004	3091	10/04/2019	10.1	7.7	193	<2	100.00%	11.26	24.9	<0.010	5.96	<0.07
3021	3088	10/04/2019	7.3	7.43	439	<2	87.00%	10.5	140	0.03	18.3	<0.07
3031	3090	10/04/2019	10.7	7.7	662	4	113.00%	12.58	271	<0.010	15	<0.07
3111	3089	10/04/2019	10.2	7.55	637	2	96.00%	10.76	225	0.028	15.6	<0.07
3101	3192	11/04/2019	9.2	7.09	263	<2	101.00%	11.6	68.7	<0.010	9.3	<0.07
3201	3193	11/04/2019	9.1	7.17	223	<2	102.00%	11.7	53.2	<0.010	8.58	<0.07
2007	3191	11/04/2019	8	7.03	278	<2	93.80%	11.12	55.7	0.463	15.6	<0.07
2311	5059	14/06/2019	10.8	7.62	75.1	<2	95.00%	10.56	8.29	0.031	1.83	<0.07
2315	5060	14/06/2019	10.2	7.69	59.6	<2	95.00%	10.73	4.93	0.024	1.12	<0.07
2201	5054	14/06/2019	10.7	7.58	189	<2	97.00%	10.78	41.3	0.016	7.66	<0.07
2211	5055	14/06/2019	11.4	7.81	77.3	<2	97.00%	10.54	10.9	0.012	1.51	<0.07
2213	5057	14/06/2019	10.4	7.64	79.4	<2	96.00%	10.74	11	<0.010	1.5	<0.07
2216	5056	14/06/2019	11.3	7.77	69.1	<2	96.00%	10.55	7.73	0.017	1.32	<0.07
2218	5058	14/06/2019	11.3	7.72	61.1	<2	96.00%	10.52	4.37	0.012	1.21	<0.07
2715	5231	19/06/2019	11.8	7.59	208	<2	89.00%	9.68	55	0.035	6.81	<0.07
2718	5230	19/06/2019	12.7	7.85	167	<2	93.00%	9.83	30.5	0.016	2.07	<0.07
2720	5232	19/06/2019	12.4	7.63	187	<2	93.00%	9.97	34.4	0.035	1.38	<0.07
2721	5235	19/06/2019	11.7	7.83	112	<2	94.00%	10.22	6.94	0.014	0.87	<0.07
2726	5229	19/06/2019	12.2	7.97	150	<2	90.00%	9.63	29.1	0.159	4.39	0.11
2728		19/06/2019	12.4	7.83	212	<2	92.00%	9.8	55.1	0.029	6.04	<0.07
2801	5233	19/06/2019	12.7	7.76	137	<2	94.00%	10	19.3	0.01	2.03	<0.07

2802	5234	19/06/2019	14.4	7.83	116	<2	95.00%	9.75	13	<0.010	0.74	<0.07
2006	5237	19/06/2019	14.6	7.29	193	<2	95.00%	9.66	47.5	0.072	8.37	0.38
2028	5236	19/06/2019	11.4	7.57	140	<2	92.00%	10.06	3.47	0.012	0.2	<0.07
2603	5307	20/06/2019	11.7	7.76	104	<2	90.00%	9.74	9.63	0.023	2.76	<0.07
2634	5306	20/06/2019	12.3	7.66	131	<2	89.00%	9.54	29.3	<0.010	2.24	<0.07
2651	5305	20/06/2019	12.1	7.57	178	<2	89.00%	9.58	42.8	0.018	3.88	<0.07
2422	5309	20/06/2019	11	7.75	79.4	<2	90.00%	9.98	4.26	<0.010	0.87	<0.07
2423	5308	20/06/2019	11.9	7.85	64	<2	91.00%	9.82	5.6	<0.010	0.46	<0.07
2424	5311	20/06/2019	13.6	7.1	430	<2	79.00%	8.26	154	0.138	6.6	<0.07
2427	5310	20/06/2019	13.3	7.66	75.4	<2	96.00%	9.99	7	0.019	1.44	<0.07
2429	5312	20/06/2019	12.9	7.57	105	<2	93.00%	9.86	15	0.013	5.19	<0.07
2430	5313	20/06/2019	13.9	7.74	69	<2	97.00%	10.02	4.93	<0.010	0.95	<0.07
2431	5314	20/06/2019	12.1	7.69	78.2	<2	94.00%	10.06	6.05	<0.010	1.18	<0.07
2432	5315	20/06/2019	13.8	7.72	67.2	<2	96.00%	9.98	4.7	0.014	0.87	<0.07
2433	5317	20/06/2019	12.8	7.68	60.7	<2	93.00%	9.89	4.14	<0.010	1.13	<0.07
2434	5316	20/06/2019	13.3	7.61	81.2	<2	96.00%	10.03	6.05	<0.010	1	<0.07
2004	5810	04/07/2019	15.8	6.59	228	<2	97.30%	9.65	51.3	0.023	11	0.3
2013	5809	04/07/2019	14.5	6.79	153	<2	94.00%	9.58	28.7	0.012	7.01	<0.07
2015	5814	04/07/2019	13.5	6.65	169	<2	94.20%	9.82	39.2	0.018	4.5	<0.07
2017	5812	04/07/2019	13.6	6.77	110	<2	92.00%	9.83	19.2	0.013	3.53	<0.07
2019	5813	04/07/2019	13.7	6.76	124	<2	95.70%	9.93	17.9	<0.010	8.74	<0.07
2022	5811	04/07/2019	12.3	6.97	69.5	<2	92.00%	9.85	5.26	0.073	1.13	<0.07
2436	5808	04/07/2019	15.7	7.36	69.4	<2	95.70%	9.5	11.2	<0.010	0.13	<0.07
3002	5967	10/07/2019	16.6	7.82	268	<2	101.00%	9.83	62	0.031	6.75	<0.07
3004	5971	10/07/2019	14.3	7.98	185	<2	95.20%	9.74	26.2	0.013	3.6	<0.07
3021	5964	10/07/2019	14.8	7.03	499	2	90.10%	9.12	181	0.078	12	0.14
3031	5966	10/07/2019	15.4	7.49	678	4	89.80%	8.97	274	0.104	5.76	0.1
3240	5969	10/07/2019	15.5	7.59	465	4	91.60%	9.13	139	0.023	13.1	<0.07
3241	5970	10/07/2019	15.6	7.76	356	<2	95.20%	9.47	81.8	0.027	1.03	0.14
3242	5968	10/07/2019	13.5	7.56	564	<2	92.80%	9.67	180	0.05	13.6	<0.07

3111	5965	10/07/2019	13.2	7.41	569	<2	88.20%	9.25	218	0.074	9.65	0.18
3243	5972	10/07/2019	15	7.66	350	<2	95.70%	9.65	106	0.014	14.3	<0.07
2101	6043	11/07/2019	14.2	7.24	249	<2	94.40%	9.69	45.6	0.087	7.9	0.07
2102	6044	11/07/2019	13.8	7.34	226	<2	97.30%	10.07	49.4	0.013	9.58	0.06
2103	6045	11/07/2019	14	7.4	193	<2	97.10%	10	42.1	0.017	6.55	0.06
3245	6046	11/07/2019	17.4	7.61	322	<2	105.00%	10.05	70.9	0.051	15.2	0.07
2711	6231	17/07/2019	14.7	7.27	270	<2	94.50%	9.59	68.4	0.066	7.86	0.08
2714	6232	17/07/2019	14.4	7.37	233	2	92.50%	9.44	51.5	0.444	9.94	0.47
2722	6233	17/07/2019	14.5	7.45	127	<2	92.90%	9.47	24.9	<0.010	2.35	<0.07
2725	6234	17/07/2019	14.5	7.61	87.3	<2	95.30%	9.71	12.1	0.016	0.98	<0.07
3101	6852	07/08/2019	15.2	7	200	<2	91.00%	9.11	50.7	<0.010	3.25	<0.05
2001	6856	07/08/2019	14.9	6.94	287	3	91.00%	9.19	69	0.063	10.2	<0.05
2003	6855	07/08/2019	16.1	7.03	146	<2	94.00%	9.22	30.7	0.017	3.68	0.05
2029	6854	07/08/2019	15.3	7.18	105	<2	92.00%	9.24	17.4	0.01	2.82	<0.05
2030	6853	07/08/2019	15.1	7.18	105	<2	91.00%	9.19	18.9	0.012	2.81	<0.05
2511	7049	14/08/2019	13.7	6.98	510	<2	83.00%	8.62	146	0.039	14	<0.05
2512	7050	14/08/2019	14	7.01	447	2	75.00%	7.71	125	0.042	10.7	<0.05
2513	7051	14/08/2019	14	7.03	401	2	78.00%	8.07	110	0.126	3.85	<0.05
2104	7054	14/08/2019	13.4	7.31	107	<2	92.00%	9.62	26.2	0.026	1.99	<0.05
3244	7052	14/08/2019	13.2	7.49	60.2	<2	91.00%	9.52	8.96	0.017	0.48	<0.05
3246	7053	14/08/2019	14.4	7.13	191	<2	93.00%	9.52	56.3	0.021	5.11	0.05
2031	7056	14/08/2019	14.3	7.05	232	3	94.00%	9.58	54	0.422	9.06	0.15
2027	7055	14/08/2019	13.6	7.34	95.9	<2	90.00%	9.34	13.2	0.038	1.52	<0.05
3231	7378	23/08/2019	14.5	7.6	232	<2	102.00%	10.41	47.6	0.016	9.8	<0.05
3233	7379	23/08/2019	15.1	7.58	177	3	103.00%	10.32	38	0.048	4.81	<0.05
3235	7380	23/08/2019	13.3	6.75	167	<2	98.80%	10.33	25.9	<0.010	6.58	<0.05
2002	7381	23/08/2019	14	7.44	238	<2	103.00%	10.57	47.8	0.112	11.9	0.06
2005	7382	23/08/2019	14.2	7.45	212	2	103.00%	10.59	42.7	0.176	10.5	0.07
3103	7552	29/08/2019	13.5	7.59	218	<2	98.30%	10.24	47.3	0.011	7.8	<0.05
3105	7553	29/08/2019	12.8	7.54	178	<2	98.20%	10.39	26.5	<0.010	6.21	<0.05

3107	7551	29/08/2019	14.5	7.13	163	<2	101.00%	10.25	24.5	0.018	3.76	<0.05
3108	7554	29/08/2019	14.8	6.21	139	<2	101.00%	10.2	6.38	<0.010	1.83	<0.05
3203	7554	29/08/2019	13	7.61	235	<2	98.90%	10.41	50	0.147	7.43	<0.05
3205	7556	29/08/2019	14.1	7.44	203	<2	100.00%	10.27	45.8	0.022	1.38	<0.05
2011	7584	30/08/2019	13.9	6.75	142	<2	98.00%	10.08	28.1	0.039	2.89	<0.05
2026	7585	30/08/2019	14	6.91	150	<2	98.00%	10.07	30.1	0.145	3.99	0.07
2023	7586	30/08/2019	12.8	6.58	62.2	<2	102.00%	10.76	4.82	0.01	0.43	<0.05
2421	7587	30/08/2019	15.3	6.69	79.6	<2	108.00%	10.82	6.94	0.012	0.94	<0.05
2428	7582	30/08/2019	14.4	6.74	76.4	<2	102.00%	10.46	9.74	0.019	1.33	<0.05
2435	7583	30/08/2019	14.1	6.37	76.6	<2	101.00%	10.43	6.05	0.067	0.49	<0.05
3201	7685	04/09/2019	13.4	7.63	218	<2	93.50%	9.76	55.8	0.014	5.93	<0.05
2024	7686	04/09/2019	13.6	7.2	105	<2	96.10%	9.99	16.2	<0.010	5.23	<0.05
2438	7684	04/09/2019	11.7	5.99	54.1	<2	89.10%	9.67	3.58	0.012	<0.05	<0.05
3231	9053	16/10/2019	11.5	7.45	239	<2	97.80%	10.66	44.9	0.056	12.9	<0.05
3233	9052	16/10/2019	11.2	7.39	174	<2	95.00%	10.43	38.1	0.079	5.04	<0.05
3235	9051	16/10/2019	11.4	6.82	160	<2	91.10%	9.95	26.7	0.059	6.86	<0.05
2002	9894	14/11/2019	8.5	7.16	221	<2	83.20%	9.74	44.7	0.053	12.5	<0.05
2011	9892	14/11/2019	7.1	6.76	134	<2	77.80%	9.42	26	0.046	4.66	<0.05
2026	9893	14/11/2019	7.4	6.85	142	<2	80.30%	9.66	26.9	0.067	5.86	<0.05
2421	10446	04/12/2019	7.7	6.56	79.9	<2	92.80%	11.1	8.19	0.012	1.98	<0.05
2428	10447	04/12/2019	7.5	6.57	70.7	<2	91.20%	10.9	7.97	<0.010	2.07	<0.05
2435	10448	04/12/2019	7.1	6.27	74.3	<2	91.90%	11.1	7.41	0.046	0.72	<0.05
3004	10479	05/12/2019	7.9	7.49	182	<2	90.60%	10.76	22.1	<0.010	6.51	<0.05
3021	10476	05/12/2019	8.4	7.66	447	2	88.90%	10.43	141	0.085	17.7	0.1
2711	10477	05/12/2019	7.9	7.52	176	<2	88.90%	10.56	38.5	0.046	6.72	<0.05
2714	10478	05/12/2019	7.9	7.43	165	<2	89.10%	10.58	32	0.057	6.12	0.06
2725	10475	05/12/2019	7.3	6.87	127	<2	85.90%	10.35	9.41	<0.010	3.3	<0.05
3031	10677	12/12/2019	6.9	7.71	636	3	82.70%	10.07	266	0.316	13.4	0.19
3111	10676	12/12/2019	8.6	7.8	553	<2	87.60%	10.2	219	0.099	10.97	0.18
2101	10880	18/12/2019	6.4	7.52	174	<2	96.00%	11.85	33.3	0.012	6.95	<0.05

2103	10881	18/12/2019	6.5	7.28	158	7	97.00%	11.87	29	0.016	4.86	<0.05
2001	10879	18/12/2019	8	7.17	257	<2	96.00%	11.43	57.2	0.153	11.3	<0.05
2003	10878	18/12/2019	6.4	7.22	141	<2	97.00%	11.9	25.1	0.024	7.38	<0.05
2029	10877	18/12/2019	6.4	7.23	117	<2	97.00%	11.91	18.5	0.018	6.77	<0.05
2030	10876	18/12/2019	6.2	7.21	116	<2	95.00%	11.76	18.2	0.017	6.77	<0.05
3101	10923	19/12/2019	7.9	7.68	248	<2	90.00%	10.74	63.5	0.023	8.34	<0.05
3201	10924	19/12/2019	7.7	7.69	214	<2	90.00%	10.7	48.2	0.023	8.85	<0.05
2007	10925	19/12/2019	8.8	7.6	244	<2	92.00%	10.68	50.2	0.155	11.1	0.05
2023	10926	19/12/2019	7.5	6.45	60	<2	93.00%	11.13	6.4	<0.010	1.19	<0.05
2103		10/01/2020	6.7	7.24	155	<2	92.00%	11.32	31.3	0.021	4.83	<0.05
2101	4782	02/07/2020	12.3	7.59	223	<2	94.00%	10.1	45.9	0.079	6.6	0.1
2102	4781	02/07/2020	12.1	7.78	225	<2	94.60%	10.2	44.9	0.01	7.19	0.07
3245	4780	02/07/2020	14.6	7.8	335	<2	100.00%	10.2	73.3	0.05	17.8	<0.05
3246	4779	02/07/2020	12.2	7.66	299	2	93.80%	10.1	70	<0.010	8.74	0.06
3303	4783	02/07/2020	12.2	7.46	195	<2	94.60%	10.2	41.3	0.018	5.76	<0.05
2004	4785	02/07/2020	14.1	7.27	232	2	96.10%	9.88	49.9	0.059	7.62	0.13
2013	4784	02/07/2020	13.3	7.5	140	<2	97.70%	10.2	25.8	0.029	4.42	<0.05
2015	4790	02/07/2020	13.1	7.47	159	<2	96.90%	10.2	34.5	<0.010	2.98	<0.05
2017	4788	02/07/2020	12.9	7.03	97.6	<2	99.00%	10.5	11.4	<0.010	1.12	<0.05
2019	4789	02/07/2020	13	7.47	159	<2	99.90%	10.5	15.3	<0.010	5.77	<0.05
2022	4787	02/07/2020	13.2	6.51	73.6	<2	94.60%	9.93	6.39	0.099	0.7	<0.05
2023	4786	02/07/2020	13.3	6.65	75.6	<2	99.00%	10.4	3.36	<0.010	0.49	<0.05
2603	4987	09/07/2020	12.5	7.27	102	<2	99.60%	10.6	9.42	0.026	1.22	<0.05
2634	4986	09/07/2020	12.8	7.63	165	<2	96.60%	10.22	44.4	0.014	2.09	<0.05
2651	4985	09/07/2020	12.6	7.67	182	<2	99.00%	10.52	39.8	0.025	3.13	<0.05
2711	4984	09/07/2020	12.7	7.45	144	2	98.70%	10.46	30.6	0.041	2.62	<0.05
2714	4980	09/07/2020	12.5	7.28	153	2	96.50%	10.28	26	0.148	3.59	0.1
2715	4978	09/07/2020	11.9	7.4	206	<2	93.60%	10.11	50	0.029	3.96	<0.05
2718	4979	09/07/2020	12.2	7.34	132	2	98.50%	10.57	18.1	0.031	1.15	<0.05
2721	4976	09/07/2020	11	6.46	110	4	95.60%	10.54	6.28	0.014	0.47	<0.05

2722	4981	09/07/2020	12.1	7.07	87.2	<2	95.50%	10.27	9.87	0.019	0.58	<0.05
2725	4988	09/07/2020	11.6	7.04	79.9	<2	97.70%	10.61	5.38	0.02	0.25	<0.05
2726	4982	09/07/2020	12.7	7.28	115	2	99.30%	10.52	16.8	0.068	1.64	<0.05
2728	4983	09/07/2020	12.9	7.54	144	2	99.80%	10.54	30.3	0.035	2.55	<0.05
3307	4989	09/07/2020	12.4	6.99	80.4	<2	99.70%	10.64	8.52	0.018	0.34	<0.05
2311	5020	10/07/2020	12	6.78	80.5	<2	93.50%	10.07	8.3	0.049	1.66	0.05
2315	5019	10/07/2020	11.2	6.73	67.9	<2	91.90%	10.09	5.27	<0.010	0.74	<0.05
3243	5027	10/07/2020	13	7.82	330	<2	96.90%	10.2	89.5	<0.010	9.41	0.09
2201	5026	10/07/2020	12.1	7.03	180	<2	97.50%	10.48	33.4	<0.010	6.59	<0.05
2211	5022	10/07/2020	12.8	6.99	90.5	<2	95.70%	10.12	12.6	<0.010	1.92	<0.05
2213	5023	10/07/2020	12.1	7.07	88	<2	96.90%	10.42	11.2	<0.010	1.48	<0.05
2216	5024	10/07/2020	12.7	7.03	84.1	<2	97.90%	10.38	11.7	<0.010	2.1	<0.05
2218	5025	10/07/2020	12.4	6.86	74.2	<2	97.90%	10.45	7.29	0.011	2.08	<0.05
3244	5021	10/07/2020	11.1	6.93	101	<2	93.60%	10.29	13.7	<0.010	0.81	<0.05
3002	5230	16/07/2020	14.4	7.6	2.91	<2	101.00%	10.3	66.6	0.026	7.48	<0.05
3103	5223	16/07/2020	13.8	7.58	220	<2	98.60%	10.2	54.8	0.023	3.75	<0.05
3105	5224	16/07/2020	13.8	7.61	219	2	98.70%	10.2	48.4	0.032	4.97	<0.05
3107	5221	16/07/2020	14	7.17	167	2	97.90%	10.1	26.1	0.029	1.22	<0.05
3240	5226	16/07/2020	14.5	7.5	455	<2	97.00%	9.89	137	0.019	14.1	0.1
3241	5225	16/07/2020	14.4	7.83	355	2	99.10%	10.1	83.4	0.025	0.69	0.15
3242	5227	16/07/2020	13.7	8.03	545	2	98.70%	10.2	181	0.053	14.1	<0.05
3205	5220	16/07/2020	13.1	7.39	203	2	95.10%	9.99	48.9	0.019	0.94	<0.05
3233	5229	16/07/2020	15.9	7.61	222	6	92.50%	9.15	62.8	0.02	1.5	0.46
3235	5230	16/07/2020	13	7.65	180	<2	96.10%	10.1	30.3	0.013	6.24	<0.05
3306	5222	16/07/2020	13.8	7.47	213	<2	98.40%	10.2	51.9	0.015	2.79	<0.05
2026	5231	16/07/2020	14.2	7.08	162	4	90.60%	9.29	31.4	0.372	6.13	0.32
2027	5232	16/07/2020	13.7	6.88	128	2	86.50%	8.97	25.8	0.071	1.27	<0.05
2002	5265	17/07/2020	13.3	7.55	268	<2	95.40%	9.98	55.2	0.022	10.7	0.12
2005	5266	17/07/2020	13.5	7.55	242	<2	95.30%	9.93	52.8	0.027	9.87	0.15
2031	5264	17/07/2020	13.5	7.56	291	2	96.00%	10	63.4	0.196	11.8	0.09

2028	5263	17/07/2020	12.4	5.86	149	<2	92.40%	9.87	2.58	0.047	0.15	<0.05
2801	5558	29/07/2020	11.7	6.78	128	<2	100.00%	10.89	12.2	<0.010	1.91	<0.05
2802	5559	29/07/2020	11.9	6.83	120	<2	101.00%	10.88	7.85	<0.010	1.58	<0.05
2001	5563	29/07/2020	12.7	7.39	254	2	100.00%	10.61	54.7	0.051	9.11	<0.05
2003	5562	29/07/2020	13.1	7.16	116	<2	102.00%	10.72	17.6	0.02	3.12	<0.05
2006	5561	29/07/2020	12.7	7.06	168	<2	99.00%	10.49	32.6	0.069	5.76	0.09
2011	5560	29/07/2020	12	6.71	129	<2	94.00%	10.15	18.8	0.12	2.23	<0.05
2511	5669	31/07/2020	13.4	7.7	500	<2	74.00%	7.76	180	0.029	20.8	<0.05
2512	5670	31/07/2020	14.1	7.46	432	<2	76.00%	7.79	151	0.028	15	<0.05
2436	5668	31/07/2020	12.6	6.35	53.3	<2	89.00%	9.46	4.48	<0.010	0.09	<0.05
2513	5778	05/08/2020	15.5	7.52	359	2	76.00%	7.61	125	0.108	4.91	<0.05
2421	5775	05/08/2020	14.3	6.74	67.8	<2	98.00%	10.02	6.17	<0.010	0.56	<0.05
2422	5774	05/08/2020	13.7	6.73	77	<2	96.00%	9.99	5.94	<0.010	0.62	<0.05
2423	5773	05/08/2020	14.1	6.78	62.3	<2	97.00%	9.93	6.17	<0.010	0.4	<0.05
2424	5777	05/08/2020	14.9	7.83	417	2	83.00%	8.34	159	0.091	6.7	<0.05
2427	5776	05/08/2020	15.5	6.73	75.1	<2	100.00%	9.94	7.96	<0.010	1.01	<0.05
2429	5779	05/08/2020	14.5	7.41	103.1	<2	98.00%	9.94	15.4	<0.010	3.48	<0.05
2430	5780	05/08/2020	15.2	7.44	68.6	<2	99.00%	9.97	7.29	<0.010	0.65	<0.05
2433	5782	05/08/2020	14.5	6.01	48.5	<2	98.00%	9.98	5.72	<0.010	0.19	<0.05
2434	5781	05/08/2020	15	7.26	67.8	<2	99.00%	9.93	6.17	0.022	0.59	<0.05
2438	5783	05/08/2020	13.3	5.64	48.5	<2	88.00%	9.19	4.26	<0.010	0.05	<0.05
3004	6013	12/08/2020	15.3	7.49	175	<2	92.60%	9.27	26.2	<0.010	2.75	<0.05
3021	6014	12/08/2020	17.6	7.67	467	<2	93.30%	8.9	180	0.041	7.02	0.3
3031	6015	12/08/2020	19.3	7.7	691	<2	89.80%	8.28	308	0.047	3.6	0.22
3304	6019	12/08/2020	17.2	7.98	162	<2	95.40%	9.18	27.13	0.011	4.69	<0.05
3305	6017	12/08/2020	17.6	8.12	198	<2	98.40%	9.38	43.61	0.013	5.2	<0.05
3111	6016	12/08/2020	14.7	7.76	681	<2	91.90%	9.32	249	0.081	9.76	<0.05
3203	6018	12/08/2020	16.5	7.94	203	<2	97.20%	9.48	51.5	0.021	5.46	<0.05
3231	6012	12/08/2020	15.9	7.4	248	<2	92.80%	9.18	53.8	0.013	10.4	<0.05
3201	6121	14/08/2020	16.3	7.37	211	<2	103.00%	10.1	54.6	<0.010	5.81	<0.05

3301	6119	14/08/2020	15.7	6.51	96.9	<2	101.00%	10	17.3	0.013	3.12	<0.05
3302	6120	14/08/2020	16.4	6.64	90.7	<2	102.00%	10	14.4	0.014	4.05	<0.05
2428	6118	14/08/2020	14.8	6.43	68.1	<2	101.00%	10.2	11.4	0.021	0.79	<0.05
2431	6117	14/08/2020	14.3	6.38	69.9	<2	98.80%	10.1	11.8	<0.010	0.37	<0.05
2432	6116	14/08/2020	14.8	6.39	62.2	<2	101.00%	10.2	10.8	0.028	0.47	<0.05
2435	6115	14/08/2020	14.1	6.18	123	<2	98.80%	10.2	11	0.048	0.49	<0.05
2720	4977	07/09/2020	11.5	7.16	147	<2	97.80%	10.66	19.5	0.017	0.81	<0.05
3021	8053	15/10/2020	10.6	7.58	413	<2	92.00%	10.23	136	0.101	10.5	0.13
3031	8054	15/10/2020	10.6	7.58	670	<2	89.00%	9.92	295	0.065	10.9	0.09
3304	8050	15/10/2020	9.5	7.32	179	<2	95.00%	10.81	29.7	0.021	6.48	<0.05
3305	8051	15/10/2020	9.8	7.38	224	<2	94.00%	10.7	52.4	0.021	7.09	<0.05
3111	8052	15/10/2020	11.4	7.4	610	<2	9.00%	10.01	241	0.059	10.3	0.06
3203	8055	15/10/2020	10.3	8.05	206	<2	96.00%	10.76	48.3	0.017	7.35	<0.05
3233	8056	15/10/2020	10.6	7.79	238	<2	97.00%	10.82	47.3	0.02	10.7	<0.05
3004	8097	16/10/2020	10	6.94	189	<2	98.00%	11.09	23	<0.010	5.35	<0.05
2711	8093	16/10/2020	8.9	6.93	169	<2	96.00%	11.18	37.5	0.012	5.06	<0.05
2718	8092	16/10/2020	8.6	6.82	151	<2	95.00%	11.08	29.4	<0.010	2.63	<0.05
2721	8095	16/10/2020	8.4	6.92	115	<2	94.00%	11.08	7.03	<0.010	1.11	<0.05
2725	8094	16/10/2020	8.2	7.14	93.2	<2	94.00%	11.08	11.2	<0.010	2.65	<0.05
2802	8096	16/10/2020	8.9	6.96	125	<2	95.00%	10.98	9.52	<0.010	1.53	<0.05
3205	8100	16/10/2020	10.6	7.06	201	<2	97.00%	10.85	43.6	0.046	2.01	<0.05
3306	8099	16/10/2020	10	7.04	192	<2	98.00%	11.1	44.3	<0.010	5.77	<0.05
2028	8101	16/10/2020	9.4	5.37	147	<2	97.00%	11.12	2.04	0.011	0.84	<0.05
3107	8277	21/10/2020	10.7	6.97	151	<2	88.00%	9.79	25.3	0.028	2.87	<0.05
2603	8279	21/10/2020	10.7	7.1	108	<2	91.00%	10.06	10.2	0.01	3.83	<0.05
2651	8278	21/10/2020	11	6.99	154	<2	90.00%	9.94	33.1	0.016	3.12	<0.05
2423	8280	21/10/2020	11	7.14	58.7	<2	91.00%	10.08	3.29	0.01	0.53	<0.05
2436	8281	21/10/2020	10.5	7.14	53.3	<2	92.00%	10.25	4.53	0.011	0.16	<0.05
3201	8326	22/10/2020	10.2	7.35	213	<2	93.00%	10.5	48.3	0.018	7.09	<0.05
2006	8323	22/10/2020	10.4	6.89	167	<2	90.00%	10.08	40.1	0.032	6.17	<0.05

2027	8322	22/10/2020	10.2	6.55	124	<2	82.00%	9.19	21.3	0.029	1.89	<0.05
2023	8324	22/10/2020	9.5	7.22	57.9	<2	92.00%	10.54	4.19	0.01	0.41	<0.05
2030	8325	22/10/2020	10.1	7.01	106	<2	93.00%	10.52	16.2	<0.010	4.54	<0.05
3303	8845	06/11/2020	9.9	7.08	147	<2	98.00%	11.07	26.6	0.024	3.29	<0.05
2002	8846	06/11/2020	10.8	7	226	<2	99.00%	10.92	43.5	0.04	11.2	<0.05
2311	8933	10/11/2020	10.8	6.72	100	<2	96.50%	10.69	14.8	0.054	3.33	<0.05
2512	8936	10/11/2020	11.6	6.74	404	<2	77.80%	8.46	13.2	0.254	10	<0.05
2211	8930	10/11/2020	10.5	6.67	96.2	<2	94.90%	10.59	16.4	0.03	3.41	<0.05
2213	8931	10/11/2020	10.5	6.69	97.1	<2	94.90%	10.59	16.3	0.03	3.34	<0.05
3244	8932	10/11/2020	10.3	6.74	93.2	<2	93.80%	10.51	14.6	0.02	1.3	<0.05
3301	8939	10/11/2020	11.1	6.72	124	<2	97.90%	10.77	19.5	0.026	6.78	<0.05
2421	8934	10/11/2020	10.7	6.81	81.3	<2	96.00%	10.66	5.67	0.032	1.72	<0.05
2428	8935	10/11/2020	10.3	6.83	68	<2	97.40%	10.92	6.91	0.038	1.39	<0.05
2432	8937	10/11/2020	10	7.08	57.5	<2	106.00%	10.86	4.87	0.057	0.65	<0.05
2435	8938	10/11/2020	9.8	6.82	73.9	<2	95.60%	10.84	5.55	0.058	0.59	<0.05
2714	9392	26/11/2020	8.7	6.77	159	<2	93.00%	10.89	30.6	0.116	4.68	<0.05
2801	9393	26/11/2020	8.6	6.9	135	<2	95.00%	11.11	16	<0.010	2.81	<0.05
3307	9394	26/11/2020	8.6	6.95	104	<2	95.00%	11.07	11.2	<0.010	3.13	<0.05
2101	9397	26/11/2020	8.4	6.83	176	<2	95.00%	11.2	33.7	0.015	6.02	<0.05
2001	9398	26/11/2020	9.7	6.74	270	<2	95.00%	10.85	63.8	0.186	10.2	<0.05
2003	9399	26/11/2020	9	6.97	127	<2	98.00%	11.3	21.4	0.016	6.31	<0.05
2011	9395	26/11/2020	9	6.82	139	<2	91.00%	10.51	26.9	0.071	3.83	<0.05
3302	9396	26/11/2020	8.9	6.88	108	<2	95.00%	10.97	12.4	0.012	8.35	<0.05

11.3. Appendix 3 – RAW Data (Metal Assessment)

Site Code	Government Lab Reference	Sampling Date	Dissolved Cadmium (µg/L)	Dissolved Copper (µg/L)	Dissolved Manganese (µg/L)	Dissolved Nickel (µg/L)	Dissolved Zinc (µg/L)	Dissolved Iron (µg/L)
2718	4979	09/07/2020	<0.5	<20	112	<5	172	356
2721	4976	09/07/2020	<0.05	<20	91.7	<5	28.1	308
2315	5019	10/07/2020	<0.5	<20	14	<5	55	26.2
2211	5022	10/07/2020	0.78	<20	13	<5	303	57.1
2216	5024	10/07/2020	1.34	<20	24.8	<5	494	65.5
2218	5025	10/07/2020	0.89	<20	27.5	<5	286	32.7
3244	5021	10/07/2020	<0.5	<20	5.2	<5	37.8	47
3205	5220	16/07/2020	<0.5	<20	74.8	<5	20.9	212
2801	5558	29/07/2020	<0.5	<20	11.2	<5	58.5	110
2802	5559	29/07/2020	<0.5	<20	17.6	<5	70.1	116
2513	5778	05/08/2020	<0.5	<20	166	<5	<20	766
2422	5774	05/08/2020	<0.5	<20	10.2	<5	26.8	55.7
3203	8055	15/10/2020	<0.5	<20	12	<5	21.8	123
2718	8092	16/10/2020	<0.5	<20	130	<5	190	127
2721	8095	16/10/2020	<0.5	<20	105	<5	41.1	168
2802	8096	16/10/2020	<0.5	<20	36.2	<5	67.6	94
3205	8100	16/10/2020	<0.5	<20	131	<5	49.3	213
2311	8933	10/11/2020	<0.5	<20	7.3	<5	24.1	25.9
2512	8936	10/11/2020	<0.5	<20	531	5.9	<20	1096
2211	8930	10/11/2020	0.53	<20	9.7	<5	208	42.8
3244	8932	10/11/2020	<0.5	<20	8.7	<5	70.3	90.2