

ENVIRONMENTAL DEPARTMENT  
CORNWALL AREA



NRA

FINAL DRAFT REPORT

AN INVESTIGATION OF THE  
WATER QUALITY IN THREE  
PLYMOUTH CATCHMENT STREAMS

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South Western Region*

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## AN INVESTIGATION OF THE WATER QUALITY IN THE PLYMOUTH CATCHMENT STREAMS

### 1. TERMS OF REFERENCE

#### 1.1 Objectives

1.1.1 To assess current water quality in three Plymouth streams using General Quality Assessment (GQA).

#### 1.2 Method

1.2.1 Set up a route to spot sample at strategic points from the streams and carry out twice weekly sampling during late Summer/Autumn 1994.

1.2.2 Run all processed water quality data through the National Rivers Authority GQA classification software and report on face value figures.

### 2. RESULTS

#### 2.1 Water Quality Data

2.1.1 All of the data has been compiled into a table marked Appendix 1 and class explanation can be found in Appendix 4.

2.1.2 Analytical sheets showing all data can be found in Appendix 3.

2.1.3 Coloured maps have been produced to show face value GQA classifications for the three Plymouth streams - Appendix 2.

### 3. BACKGROUND

#### 3.1 Tamerton Foliot Streams

The Tamerton Foliot streams drain from industrial estates in the headwaters and from an old tip site. The streams flow through wooded valleys for a short distance before flowing through Tamerton Foliot accepting highway drainage and acting as a public amenity. The stretch of controlled waters below the sample points Belliver (SX 4698 6098) and Southway (SX 4699 6098) is tidal.

#### 3.2 Forder Valley Stream

The Forder Valley stream issues from Plymouth Airport at Roborough and Derriford. The final sampling point (Wilburt Road SX 5100 5750) is the lowest easy access point to monitor this stream which eventually flows into the Efford Marsh.

#### 3.3 Hartley Stream

This stream issues around Eggbuckland from made up ground which has been culverted. Fly tipping is a problem above Allerton Walk (SX 4987 5787). A large part of this stream has been culverted and runs adjacent to the A38 (Parkway) before it runs into the Efford Marsh above the confluence of the Forder Valley stream.

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#### 4. DISCUSSION

##### 4.1 Tamerton Foliot Streams

The data for the Tamerton Foliot streams indicated good water quality in the main apart from two small areas. Porsham Lane had one high BOD and one further BOD above 2.5mg/l. There was no indication of any pollution at the time of sampling at this point. The area above Pendeen Tip monitoring point is partially culverted and the stream substrate showed signs of organic enrichment. Ochrous deposits were also evident in a culvert pipe. There is no evidence that the analytical results were influenced by climatic conditions.

##### 4.2 Hartley Stream

The data indicated poor water quality upstream of the Buckland overpass monitoring point on the Hartley stream. On occasions the stream appeared polluted with soapy water/road washings. There was no evidence of storm sewer overflows operating or sewage debris in the stream. The watercourse upstream of the Allerton Walk monitoring point had three elevated BOD figures. The ammonia levels in the samples collected at this point were below detection limits. The Byrne Road tributary was found to be of good water quality.

##### 4.3 Forda Valley Stream

The Forder Valley stream data indicated good water quality throughout. Although one BOD figure at the Derriford Barton monitoring point was elevated no pollution was suspected at the time of sampling.

#### 5. CONCLUSIONS

5.1 The Tamerton Foliot streams water quality is good apart from two areas:

- (a) Below Pendeen Tip.
- (b) Upstream of Porsham Lane.

5.2 The Hartley streams water quality was poor below Allerton Walk and Byrne Road. Colour at time of sampling indicated mild pollution. The area upstream of Allerton Walk and Byrne Road showed no signs of pollution.

5.3 The Forder Valley streams water quality was good.

#### 6. RECOMMENDATIONS

6.1 To investigate reasons for poor water quality and identify possible actions.

Action: Senior Water Quality Officer

PLYMOUTH STREAMS GENERAL QUALITY ASSESSMENT SUMMARY SHEET

INVESTIGATING OFFICER: S B NEWPORT

APPENDIX 1

RIVER	STRETCH	1994 SITE NGR	DISSOLVED OXYGEN					BOD					TOTAL AMMONIA					CLASS
			Max	Min	10%ile	N	C	Max	Min	90%ile	N	C	Max	Min	90%ile	N	C	
TAMERTON FOLIOT STREAM (BELLIVER)	COOMBE COTTAGE PORSHAM LANE BELLIVER	SX 4783 6160	108	89	89.3	12	A	1.1	<1	0.86	12	A	0.02	0.02	0.01	11	A	A
		SX 4794 6166	107	91	92.1	12	A	9.8	<1	4.5	12	C	0.21	0.03	0.14	12	A	C
		SX 4698 6098	99	86	90.3	12	A	1.4	<1	1.2	12	A	0.04	<0.02	0.03	12	A	A
TAMERTON FOLIOT STREAM (SOUTHWAY)	PENDEEN TIP SOUTHWAY DRIVE BORROWDALE SOUTHWAY	SX 4815 5926	108	41	59.1	12	D	11.5	<1	5.39	12	C	7.5	0.57	4.42	12	E	E
		SX 4796 6040	103	88	89.8	12	A	2.1	<1	1.79	12	A	0.27	<0.02	0.2	12	A	A
		SX 4796 6030	102	87	91	12	A	1.2	<1	1.14	12	A	0.29	<0.02	0.097	12	A	A
		SX 4699 6089	103	88	93	12	A	2.1	<1	1.17	12	A	0.08	<0.02	0.032	12	A	A
HARTLEY STREAM	BYRNE ROAD ALLERTON WALK BUCKLAND OVERPASS	SX 4880 5810	111	83	84.7	12	A	1.8	<1	1.41	12	A	0.04	<0.02	0.023	12	A	A
		SX 4987 5787	97	81	80.5	12	A	4.6	1.2	3.35	12	B	<0.02	<0.02	0.01	12	A	B
		SX 5038 5723	97	84	84.3	12	A	9.94	1.2	10	12	E	0.09	<0.02	0.06	12	A	E
FORDER VALLEY STREAM	DERRIFORD BARTON DERRIFORD STREAM CROWNHILL STREAM NOVOROSSICK LIGHTS WILBURT ROAD	SX 5050 5990	99	86	87.9	11	A	3.7	<1	2.07	12	A	0.05	<0.02	0.02	12	A	A
		SX 5020 5870	102	88	91.2	12	A	1.2	<1	1.04	12	A	0.03	<0.02	0.02	12	A	A
		SX 5047 5849	103	85	88.3	12	A	1.2	<1	1.05	12	A	0.03	<0.02	0.01	12	A	A
		SX 5079 5839	92	81	81.2	12	A	2.5	<1	1.80	12	A	0.07	0.01	0.05	12	A	A
		SX 5100 5750	98	79	81.6	12	A	1.6	<1	1.44	12	A	0.04	<0.02	0.02	12	A	A

C = DETERMINAND CLASS

N = NUMBER OF SAMPLES

%ILE = PERCENTILE

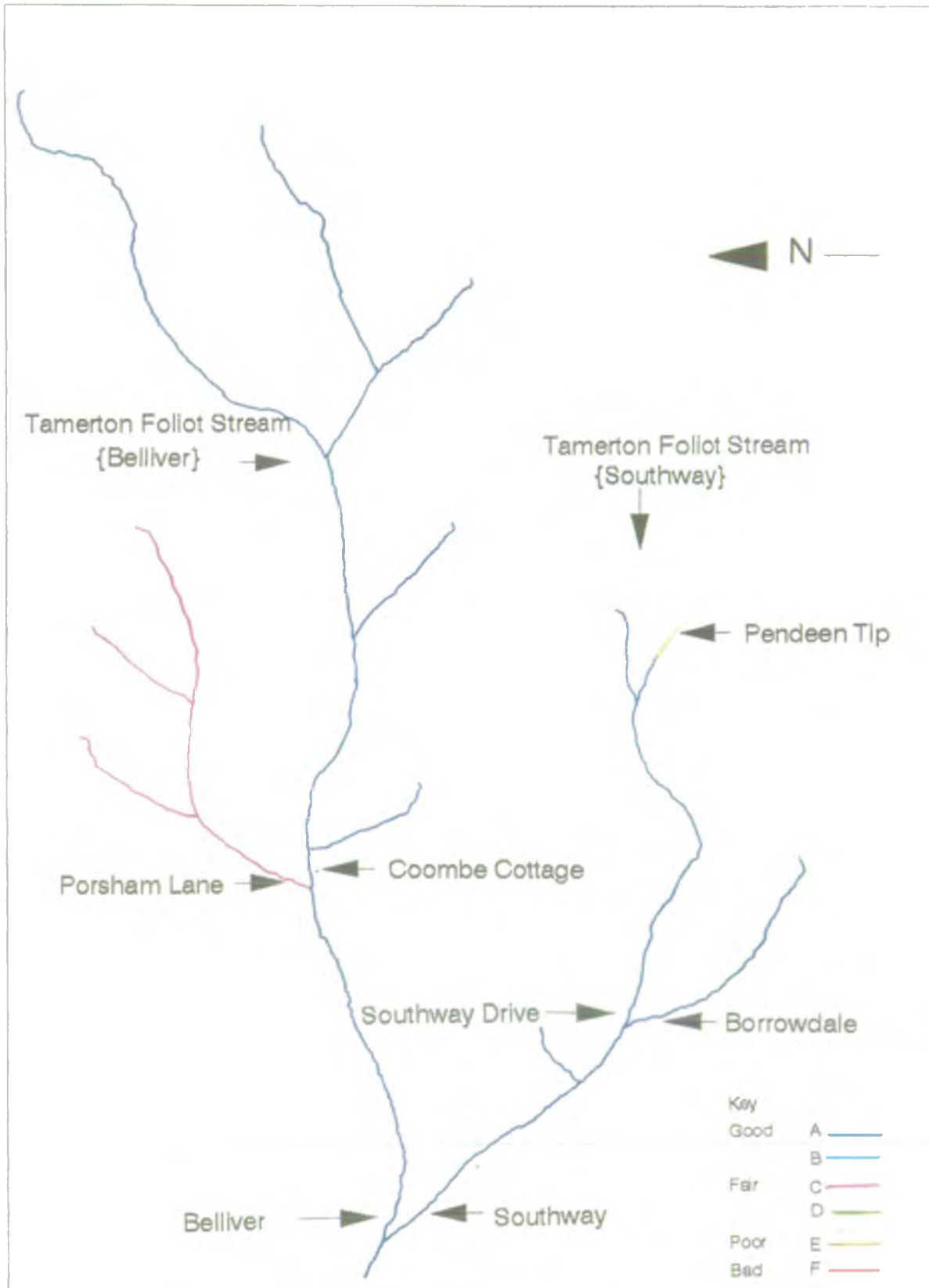
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# Tamerton Foliot Stream Catchment 12A

## GQA Classification

Investigating Officer S B Newport

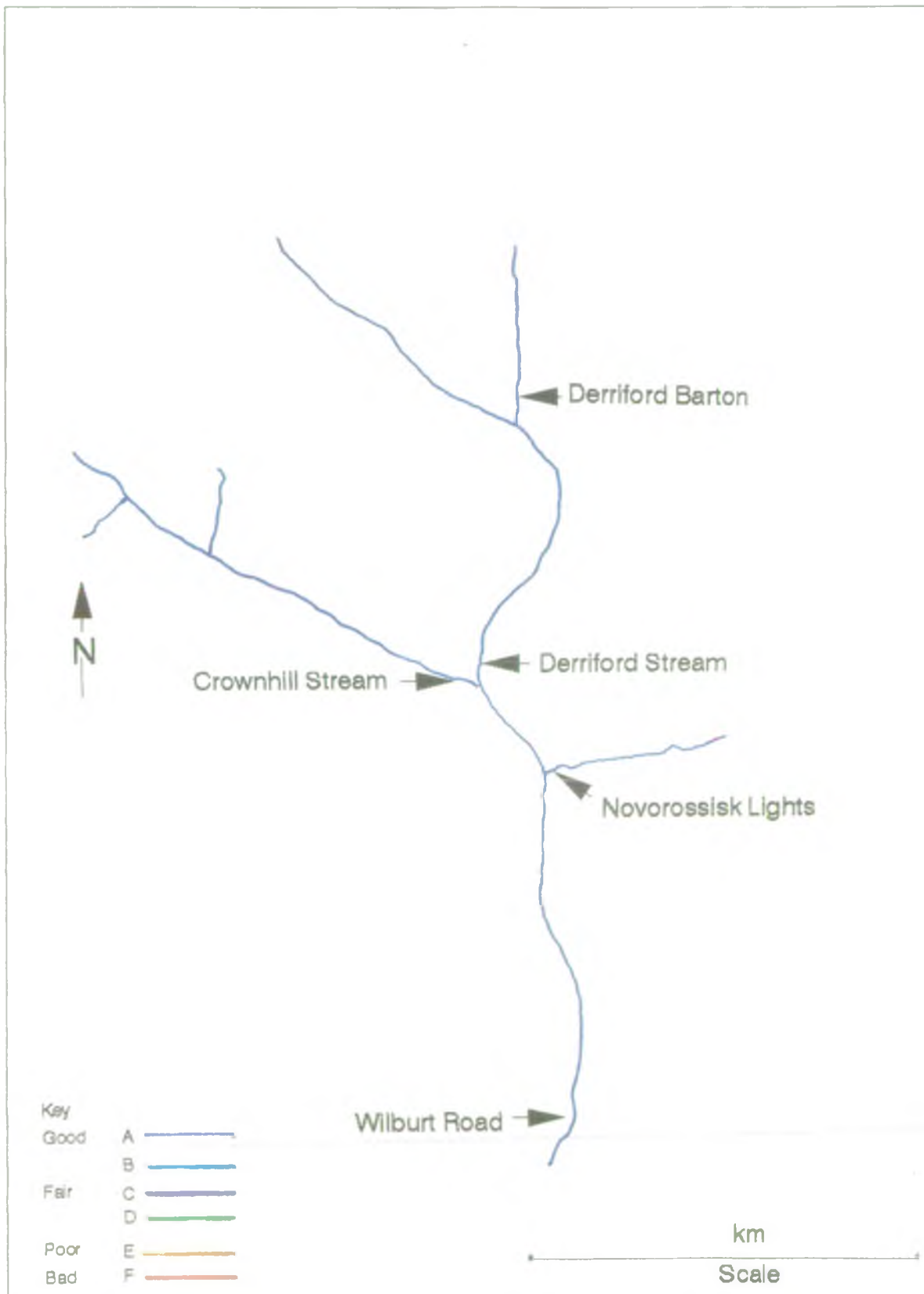
Appendix 2



Forder Valley Stream Catchment 11A  
GQA Classification

Investigating Officer S B Newport

Appendix 2

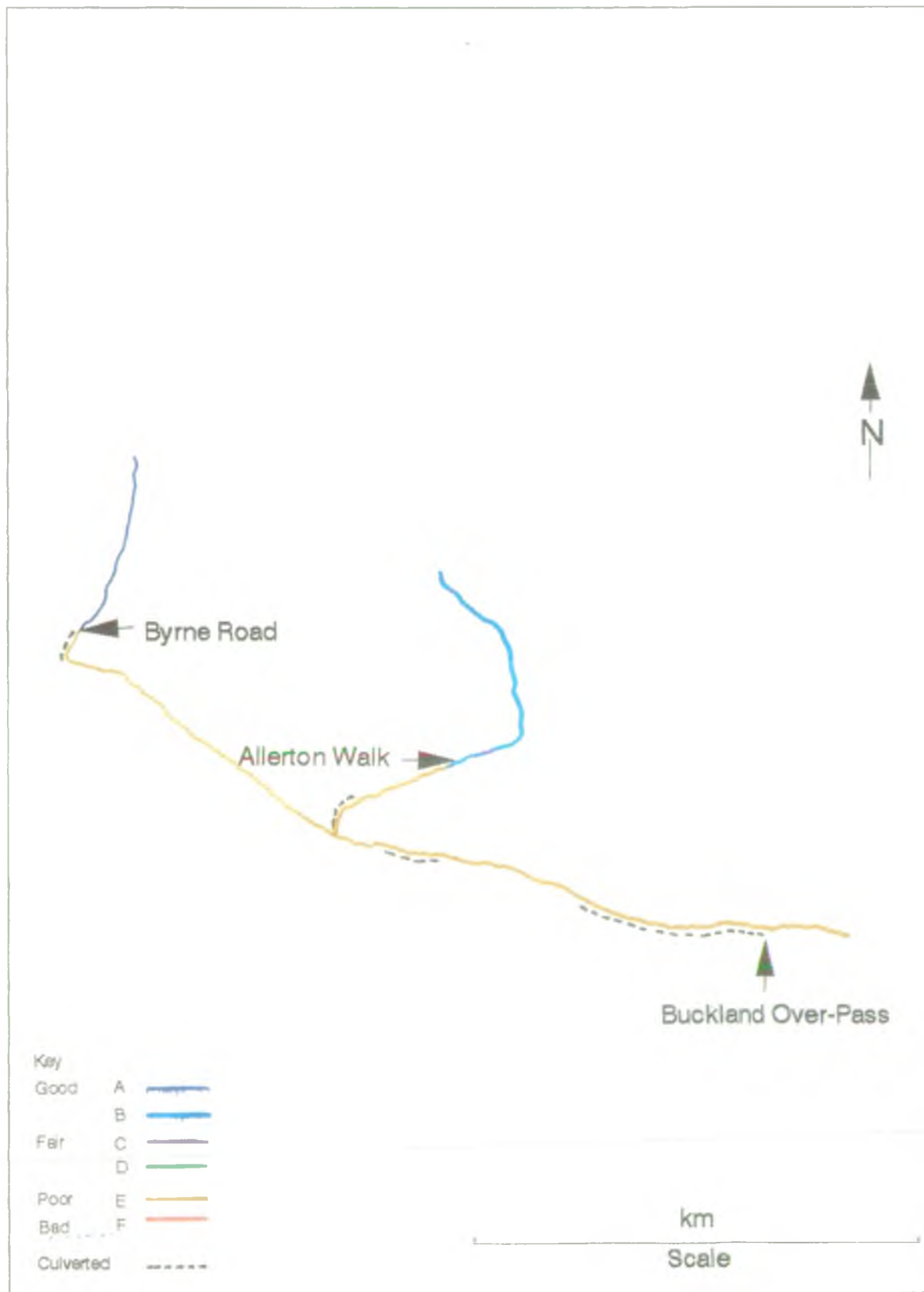


# Hartley Stream Catchment 11A

## GQA Classification

Investigating Officer S B Newport

Appendix 2



PLYMOUTH STREAMS

Investigating Officer  
S B Newport

Data For GQA

Appendix 3

Site Name Belliver SX 4698 6098

Water Quality Data For The Tamerton Foliot Stream

Date	Time	BOD	Do	Ammonia
01-Nov-94	9.31	1.2	97	0.04
04-Nov-94	10	1	93	0.03
07-Nov-94	10.31	< 1	86	0.02
09-Nov-94	10	< 1	93	0.02
16-Nov-94	9.31	< 1		0.02
17-Nov-94	11.21	1	99	0.02
21-Nov-94	10	< 1	98	0.02
24-Nov-94	10.31	< 1	99	< 0.02
28-Nov-94	11.31	< 1.4	94	0.02
29-Nov-94	10.41	< 1	94	< 0.02
05-Dec-94	10.31		95	0.03
08-Dec-94	11.01	1.2	93	
15-Dec-94	10	1.2	96	< 0.02

Site Name ~~SOUTHWAY~~ SX 4699-6089

01-Nov-94	9.45	1.1	100	0.06
04-Nov-94	10.05	< 1	100	0.06
07-Nov-94	10.35	< 1	88	0.04
09-Nov-94	10.05	< 1	95	0.04
16-Nov-94	9.35	< 1		0.08
17-Nov-94	11.25	< 1	102	< 0.02
21-Nov-94	10.05	1.2	103	0.03
24-Nov-94	10	< 1	100	< 0.02
28-Nov-94	11.35	1.3	98	< 0.02
29-Nov-94	10.35	1.3	100	< 0.02
05-Dec-94	11.11	< 1	96	< 0.02
08-Dec-94	10.05		96	
15-Dec-94	10.05	1.1	96	< 0.02

Site Name Southway Drive SX 4796 6040

01-Nov-94	10.25	< 1	90	< 0.02
04-Nov-94	10.31	1.1	98	0.2
07-Nov-94	10.45	< 1	88	0.19
09-Nov-94	10.41	< 1	96	0.15
16-Nov-94	11.32	< 1		0.27
17-Nov-94	11.41	< 1	92	0.08
21-Nov-94	10.42	1.5	103	0.12
24-Nov-94	10.45	< 1	97	0.07
28-Nov-94	11.51	2.1	94	0.1
29-Nov-94	10.35	2	93	0.04
05-Dec-94	11.15	1.3	93	0.05



Date	Time	BOD	Do	Ammonia
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08-Dec-94	11.31		96	
15-Dec-94	10.35	1.5	96	< 0.02

Site Name Borrowdale SX 4796 6030

01-Nov-94	10.39	1.2	91	0.12
04-Nov-94	10.41	< 1	95	< 0.02
07-Nov-94	11.01	1	87	< 0.02
09-Nov-94	10.45	< 1	102	< 0.02
16-Nov-94	11.35	< 1		< 0.02
17-Nov-94	11.45	< 1	98	0.29
21-Nov-94	10.45	1.1	102	< 0.02
24-Nov-94	10.51	< 1	97	< 0.02
28-Nov-94	11.55	1.2	96	< 0.02
29-Nov-94	10.31	1	97	< 0.02
05-Dec-94	11.21	< 1	96	< 0.02
08-Dec-94	11.36		99	
15-Dec-94	10.41	< 1	95	< 0.02

Site Name Pendeen Tip SX 4815 5926

01-Nov-94	11.05	1.1	84	0.57
04-Nov-94	11.01	1.1	81	1.2
07-Nov-94	11.11	< 1	73	2.2
09-Nov-94	11.01	11.5	108	1.2
16-Nov-94	11.45	< 1		1.8
17-Nov-94	11.55	< 1	86	2.3
21-Nov-94	11.15	1.2	90	1.9
24-Nov-94	11.11	< 4	82	2
28-Nov-94	12.21	8.14	75	2.9
29-Nov-94	10.15	1.3	77	3.1
05-Dec-94	11.45	1	63	7.5
08-Dec-94	11.46		90	
15-Dec-94	11.01	< 1	41	2.2

Site Name Coome Cottage SX 4783 6160

01-Nov-94	11.31	< 1	90	< 0.02
04-Nov-94	11.15	1.1	90	< 0.02
07-Nov-94	11.21	< 1	89	< 0.02
09-Nov-94	10.21	< 1	97	< 0.02
16-Nov-94	12.01	< 1		< 0.02
17-Nov-94	12.02	< 1	104	< 0.02
21-Nov-94	10.25	< 1	108	< 0.02
24-Nov-94	10.35	< 1	94	< 0.02
28-Nov-94	11.41	1	96	< 0.02
29-Nov-94	10.55	< 1	97	< 0.02
05-Dec-94	10.45	< 1	99	< 0.02
08-Dec-94	11.16		94	
15-Dec-94	10.15	< 1	97	< 0.02

Site Name Porsham Lane SX 4794 6166

01-Nov-94	11.35	9.8	91	0.1
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Date	Time	BOD	Do	Ammonia
04-Nov-94	11.21	3	94	0.08
07-Nov-94	11.25	< 1	92	0.08
09-Nov-94	10.25	1.5	98	0.09
16-Nov-94	12.05	< 1		0.06
17-Nov-94	12.11	1.3	103	0.08
21-Nov-94	10.21	1.4	107	0.1
24-Nov-94	10.41	2.2	97	0.08
28-Nov-94	11.45	1.5	98	0.05
29-Nov-94	11.01	1	97	0.04
05-Dec-94	10.51	2.1	99	0.21
08-Dec-94	11.21		96	
15-Dec-94	10.21	< 1	99	0.03

WATER QUALITY DATA FOR THE HARTLEY STREAM

Investigating Officer S B Newport

Site 1 Buckland Overpass SX 5038 5723

01-Nov-94	11.51	9.31	87	< 0.02
04-Nov-94	12.31	8.3	84	< 0.02
07-Nov-94	12.25	2.2	84	0.02
09-Nov-94	12.11	1.4	91	0.03
16-Nov-94	12.41	1.2		< 0.02
17-Nov-94	12.45	1.5	89	0.02
21-Nov-94	12.11	1.7	97	< 0.02
24-Nov-94	12.01	1.4	93	0.05
28-Nov-94	13.11	9.25	87	0.05
29-Nov-94	11.31	9.6	90	0.07
05-Dec-94	12.25	9.1	85	0.09
08-Dec-94	12.31		94	
15-Dec-94	11.35	9.94	92	0.03

Site Name Allerton Walk SX 4987 5787

01-Nov-94	12.15	2	85	< 0.02
04-Nov-94	12.11	4.6	81	< 0.02
07-Nov-94	12.11	1.9	83	< 0.02
09-Nov-94	12.01	3.2	97	< 0.02
16-Nov-94	12.31	1.2		< 0.02
17-Nov-94	12.35	1.6	91	< 0.02
21-Nov-94	11.45	1.6	95	< 0.02
24-Nov-94	11.51	1.4	88	< 0.02
28-Nov-94	13.01	1.8	83	< 0.02
29-Nov-94	11.24	2.4	82	< 0.02
05-Dec-94	12.15	2.7	82	< 0.02
08-Dec-94	12.41		88	
15-Dec-94	11.25	1.4	90	< 0.02

Site Name Byrne Road SX 4880 5810

Date	Time	BOD	Do	Ammonia
01-Nov-94	12.21	1.8	83	< 0.02
04-Nov-94	11.51	< 1	88	< 0.02
07-Nov-94	12.01	< 1	95	< 0.02
09-Nov-94	11.31	< 1	111	< 0.02
16-Nov-94	12.21	< 1		< 0.02
17-Nov-94	12.21	< 1	94	0.04
21-Nov-94	11.51	1	97	< 0.02
24-Nov-94	12.21	1.8	83	< 0.02
28-Nov-94	12.41	1.1	95	< 0.02
29-Nov-94	11.15	< 1	95	< 0.02
05-Dec-94	12.01	< 1	93	< 0.02
08-Dec-94	12.16		94	
15-Dec-94	11.11	< 1	97	< 0.02

**WATER QUALITY DATA FOR THE FORDER VALLEY STREAM**

Investigating Officer S B Newport

Site Name Wilburt Road SX5100 5750

01-Nov-94	13.11	1.3	82	< 0.02
04-Nov-94	12.45	1.2	79	< 0.02
07-Nov-94	12.41	1.1	81	< 0.02
09-Nov-94	12.31	< 1	93	< 0.02
16-Nov-94	14.01	< 1		< 0.02
17-Nov-94	13.01	< 1	91	< 0.02
21-Nov-94	12.11	1.2	95	< 0.02
24-Nov-94	12.05	1.1	89	0.04
28-Nov-94	13.25	1.6	91	< 0.02
29-Nov-94	11.41	1	90	0.03
05-Dec-94	12.35	1.1	98	0.02
08-Dec-94	12.51		87	
15-Dec-94	11.45	1	88	< 0.02

Site Name Novorossick Traffic Lights SX 5079 5839

01-Nov-94	13.41	1	81	0.03
04-Nov-94	13.01	1.5	82	0.05
07-Nov-94	12.45	< 1	81	0.03
09-Nov-94	12.45	< 1	90	0.04
16-Nov-94	14.15	< 1		0.03
17-Nov-94	13.11	2.5	83	0.01
21-Nov-94	12.26	1.1	92	0.04
24-Nov-94	12.21	< 1	88	0.01
28-Nov-94	13.41	2	82	0.07
29-Nov-94	11.51	< 1	90	0.04
05-Dec-94	12.45	< 1	88	0.02
08-Dec-94	1301		90	
15-Dec-94	11.51	1	90	< 0.02

Site Name Crownhill Stream SX 5047 5849

Date	Time	BOD	Do	Ammonia
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01-Nov-94	14.01	1.2	89	< 0.02
04-Nov-94	13.21	< 1	85	< 0.02
07-Nov-94	13.01	< 1	91	< 0.02
09-Nov-94	13.01	< 1	97	< 0.02
16-Nov-94	14.41	< 1		< 0.02
17-Nov-94	13.15	< 1	93	< 0.02
21-Nov-94	12.35	1	103	< 0.02
24-Nov-94	12.31	< 1	96	< 0.02
28-Nov-94	13.51	1.1	95	< 0.02
29-Nov-94	12.04	1	94	0.03
05-Dec-94	13.01	< 1	94	< 0.02
08-Dec-94	13.16		94	
15-Dec-94	12.15	< 1	94	< 0.02

Site Name Derriford Stream SX 5020 5870

01-Nov-94	14.21	1.2	88	0.03
04-Nov-94	13.25	< 1	93	< 0.02
07-Nov-94	13.05	< 1	92	< 0.02
09-Nov-94	13.21	< 1	97	< 0.02
16-Nov-94	14.35	< 1		< 0.02
17-Nov-94	13.21	< 1	98	0.02
21-Nov-94	12.41	< 1	102	< 0.02
24-Nov-94	12.35	< 1	100	< 0.02
28-Nov-94	13.55	1.1	100	< 0.02
29-Nov-94	12.11	< 1	99	< 0.02
05-Dec-94	13.05	1.2	95	< 0.02
08-Dec-94	13.11		94	
15-Dec-94	12.11	< 1	96	< 0.02

Site Name Derriford Barton SX 5050 5990

01-Nov-94	14.31	1.2	86	< 0.02
04-Nov-94	14.01	< 1	87	< 0.02
07-Nov-94	13.15	< 1	88	< 0.02
09-Nov-94	13.41	1.3	96	< 0.02
16-Nov-94	14.45	< 1		< 0.02
17-Nov-94	13.25	< 1	95	< 0.02
21-Nov-94	12.51	< 1	99	< 0.02
24-Nov-94	12.45	< 1	97	< 0.02
28-Nov-94	14.01	1.2	94	< 0.02
29-Nov-94	12.21	1.5	93	< 0.02
05-Dec-94	13.15	3.7		0.05
08-Dec-94	13.26		94	
15-Dec-94	12.21	1	95	< 0.02

Table 1: GQA CHEMICAL GRADING FOR RIVERS AND CANALS

Water Quality	Grade	Quality Criteria
Good	A	Dissolved oxygen % saturation $\geq 80\%$ BOD (ATU) $\leq 2.5$ mg/l O Total ammonia $\leq 0.25$ mg/l N
	B	Dissolved oxygen % saturation $\geq 70\%$ BOD (ATU) $\leq 4$ mg/l O Total ammonia $\leq 0.6$ mg/l N
Fair	C	Dissolved oxygen % saturation $\geq 60\%$ BOD (ATU) $\leq 6$ mg/l O Total ammonia $\leq 1.3$ mg/l N
	D	Dissolved oxygen % saturation $\geq 50\%$ BOD (ATU) $\leq 8$ mg/l O Total ammonia $\leq 2.5$ mg/l N
Poor	E	Dissolved oxygen % saturation $\geq 20\%$ BOD (ATU) $\leq 15$ mg/l O Total ammonia $\leq 9$ mg/l N
Bad	F	Dissolved oxygen % saturation $< 20\%$ BOD (ATU) $> 15$ mg/l O Total ammonia $> 9$ mg/l N

## STATISTICS USED BY NATIONAL RIVERS AUTHORITY

Determinand	Statistic	Distribution
Dissolved oxygen	10 percentile	Normal
BOD (ATU)	90 percentile	Log-normal
Total ammonia	90 percentile	Log-normal

## GQA grade limits

The GQA chemical grade is defined by standards for the concentration of BOD, ammonia and dissolved oxygen as summarised in Table 1. The overall class for each stretch is determined by the lowest grade of the three parameters.

Map to Show Location of the Plymouth Streams  
Investigating Officer S B Newport

