SCOTTISH ENVIRONMENT PROTECTION AGENCY

National Water Quality Classification 2006

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Summary

This report summarises the results of SEPA's monitoring of water quality in Scotland's rivers, estuaries and coastal waters in 2006. It also provides some trend information, particularly in respect of SEPA's water quality targets for 2006. These targets for the reduction of class C and D waters were set in 2000 on the basis of water quality in 1999.

Overall, the 2006 quality targets have been comfortably exceeded for rivers and coastal waters. The area of unsatisfactory water in Forth and Clyde estuaries reduced by 0.6 km^2 in 2006, giving a total net improvement since 2000 of 11.2 km^2, which exceeds the improvement target of 6.5 km^2.

In the coming years, further overall improvements can be anticipated for Scotland's waters in particular due to implementation of participative River Basin Management Planning in accordance with the requirements of the EU Water Framework Directive (WFD). Implementation of this Directive required large changes to SEPA's monitoring network at the end of 2006, making it impossible to continue the current classification series. Alternative long-term trend indicators will be developed based on the new WFD surveillance monitoring network.

Rivers

The net length of poor quality rivers and streams in classes C and D decreased by 42 km between 2005 and 2006, giving a total reduction of **435 km** since 1999. This comfortably exceeds the improvement target for the period 1999 – 2006, which was to achieve a **351 km** reduction in class C and D waters. Many of the improvements are a direct result of infrastructure investments made by Scottish Water, SEPA actions via Environmental Improvement Action Plans, and work with and through other organisations such as the Coal Authority and farming community.

Despite the very positive progress made since 1999 in improving river water quality, substantial lengths of poor quality water remain. These include numerous stretches originally targeted to be improved by 2006 and work to achieve upgrades is continuing. Conversely, numerous improvements have been achieved for watercourses which, when the targets were set in 2000, were not expected to improve by 2006. These include very welcome improvements due to Coal Authority work to intercept and treat previously polluting mine water arisings prior to their discharge to watercourses. Among the planned improvements seen in 2006 have been further significant upgrading of wastewater infrastructures and industrial premises, with some step changes in water quality due to the closure of old sewage treatment works and the diversion of effluent to newer or larger works elsewhere.

Estuaries

2006 saw a reduction of 0.6 km^2 of class C 'unsatisfactory' estuarine area, and a larger upgrading of 8.5 km^2 from class B 'good', to class A, 'excellent'. Most of this improvement was in the Clyde area. The total area improved from classes C and D, to classes A and B since 1999, excluding the Montrose Basin, is 11.2 km^2, ahead of the target of 6.5 km^2. In 2006, the Montrose Basin has been reassessed on the basis of samples taken since 2001/2, and has now been allocated to class C (unsatisfactory).

The water quality of the Forth and Clyde estuaries is significantly dependant on weather influenced river flows and historically polluted sediments. However, continuing investments by Scottish Water and industrial dischargers are delivering cleaner estuarine waters. As a

result, the long-term trend is clearly one of significant improvement. Further improvements are also expected as the contaminant load from diffuse sources carried by inflowing rivers (e.g. nutrients from agricultural activities) is reduced by measures arising from implementation of the EU 'nitrates' and water framework directives.

Coastal Waters

The net length of unsatisfactory coastal waters (class C and D) was further reduced by 22.3 km between 2005 and 2006, giving a total reduction of **231.1 km** since 1999. Thus, the target to reduce class C and D coastal waters by **145 km** in the period 1999 – 2006 has been very comfortably surpassed.

The major investments made by Scottish Water to improve the treatment of sewage discharges to coastal waters have clearly been of great benefit to water quality. On current classification measures, 90.5 km of poor quality coastal waters remain, and work to secure the upgrading of these is continuing. However, the occasional bacterial pollution of some coastal waters (including some bathing waters) due to diffuse pollution following substantial rainfall, will unfortunately continue for at least the next several years.

The Future

For 2007 and future years, new EU Water Framework Directive (WFD) classification measures will be applied to all water categories. The default quality objective under WFD is 'good ecological status', which approximates to river quality class A1/A2, and coastal and estuarine water classes A/B. A preliminary assessment of which Scottish waters may not meet these exacting standards without the intervention of management measures has been made and published by SEPA (http://www.sepa.org.uk/wfd/index.htm). Equivalent water characterisation reports are available for all other river basin districts throughout the EU.

1. Introduction: Water Quality Background Notes

Following its establishment in 1996, SEPA introduced a new rivers quality classification scheme for rivers. This included most elements and numeric standards already in use in England and Wales, but unlike there, the SEPA scheme results in a single classification class outcome incorporating biological, chemical and aesthetic elements (http://www.sepa.org.uk/data/classification/index.htm). This provision of a single overall outcome is intended to be readily understood by casual observers, while actual causes of any downgrading can still be investigated and tackled by SEPA. Existing schemes for the classification of coasts and estuaries were maintained.

On establishment, SEPA set itself water quality targets to be achieved by 2000 and it reported on the progress it made in the period 1996 – 2000. During this time, the length of unsatisfactory quality (classes C and D) rivers and coastal waters were reduced by 361 km and 25 km respectively, but the extent of unsatisfactory estuarine areas increased by 2 km^2. Further new targets were set in 2000, on the basis of 1999 water quality; the aim was for these new targets to be achieved by the end of 2006, and these were included in SEPA's Corporate Plans.

In conjunction with the new set of targets, an improved digital system for recording river and stream lengths was introduced in 1999/2000. The classification criteria remained unchanged, but are now expressed for a Digitised Rivers Network (DRN), which includes the same river systems as before plus islands' rivers and tidal waters, and which can be displayed using Geographical Information Systems (GIS). This enables river lengths to be automatically measured and river quality information to be more accessible (now available on SEPA's website at http://www.sepa.org.uk/rqc/map.asp). The apparent length of watercourses covered by the DRN is less than that of the earlier network because it does not include thousands of minor, sometimes seasonally dry, and generally remote headwater tributaries which have never been monitored. Also with the DRN, waters which are not directly monitored are described and reported as being unclassified, rather than being assumed to be of good quality, which was the former practice. This revised approach to classification was more precautionary, and consistent with future requirements.

It was SEPA's intention that the extent of unclassified rivers would be progressively reduced to as near zero as possible by the time EU Water Framework Directive (WFD) systems were put into place at the start of 2007. This was done in two ways. The first of these was the further development of an extensive network of ecological quality monitoring sites in rural areas through new, infrequent sampling. However, when any of the new sites were found to be not of good quality they were then investigated. Monitoring of such waters was continued on an annual basis until the cause of the downgrading was known and remedial action had been shown to be effective. Secondly, the allocations of river stretches to monitoring sites for quality class assignment were reassessed, and extended where appropriate. By these means, a further 10,750 km of river length was classified for the first time between 2000 and 2006. The 2007 monitoring network has been designed to enable the classification of all WFD baseline water bodies.

While SEPA's work to the present time has been significantly aimed at eliminating the most seriously polluted class C and D waters, it has become clear in the context of the WFD that this Directive's standard target of attaining "good ecological status" will imply for rivers a quality target closer to the current class A2/B boundary. In this context it is sobering to note that in 2006, in the year before the introduction of the WFD regime, the total length of class B, C and D rivers is still ~3,200 km of the 25,400 km total length.

2006 is the last year that the classification schemes reported on here, and in previous years reports, will be used by SEPA. From 2007 onwards, entirely new WFD quality classification

schemes will be applied to all waters. Other methods will be used to enable long-term water quality trends to be tracked across the SEPA/WFD methods change boundary.

In the following sections, results are set out as tables showing the length (in kilometres) of rivers classified by SEPA as Excellent, Good, Fair, Poor or Seriously Polluted (classes A1, A2, B, C and D respectively). For the area (in square kilometres) of estuaries and for the length of coastal waters there are four quality classes; Excellent, Good, Unsatisfactory (fair/poor) and Seriously Polluted (classes A, B, C, D respectively). Examples are given to show where the more significant improvements or deteriorations have occurred and the actions SEPA is taking to address problems.

2. River and Streams Water Quality

Summary annual classification outcomes for rivers and streams between 1999 and 2006 are presented in Table 1 and graphically in Figure 1 below. In 2006, class D river lengths decreased by 17.2 km and class C by 24.8 km. As a result of these decreases the 2006 river quality target of reducing class C and D waters by 351 km has easily been exceeded with the actual reduction being 435 km. A graphical representation of the combined length of class C and D river lengths over the period 1999 - 2000 relative to the 2006 target is given in Figure 2. Some of the details for the most significant quality changes in 2006 are discussed below starting in the North and working clockwise round the country.

As well as reductions in the length of class C and D waters between 2005 and 2006 there was also a net upgrading of 45 km from class B to class A2.

Table 1: River classification for the years 1999 to 2006 (DRN)

	Year	Unclassified	A1 Excellent	A2 Good	B Fair	C Poor	D Seriously Polluted	Total
Length km (%)	1999	N/A	N/A	N/A	2577.0 (10.1)	1077.7 (4.2)	91.2 (0.4)	25381.8 (100)
Length km (%)	2000*	12815.6 (50.3)	3171.5 (12.5)	6087.2 (23.9)	2453.2 (9.6)	853.9 (3.4)	73.4 (0.3)	25454.6 (100)
Length km (%)	2001	11960.1 (46.9)	3874.5 (15.2)	6324.9 (24.8)	2339.1 (9.2)	929.4 (3.6)	82.5 (0.3)	25510.5 (100)
Length km (%)	2002	7987.9 (30.5)	5279.4 (20.1)	8655.5 (33)	2562.7 (9.8)	902.9 (3.4)	56.3 (0.2)	25444.7 (100)
Length km (%)	2003	5903.3 (23.2)	6815.2 (26.8)	9540.4 (37.5)	2373.8 (9.3)	750.8 (3.0)	52.6 (0.2)	25436.1 (100)
Length km (%)	2004	3806.5 (15)	7659.9 (30.1)	10612.5 (41.7)	2587.6 (10.2)	716.6 (2.8)	50.6 (0.2)	25433.8 (100)
Length km (%)	2005	2126.4 (8.4)	8003.9 (31.5)	12053.1 (47.4)	2469.8 (9.7)	723.6 (2.8)	52.3 (0.2)	25429.1 (100)
Length km (%)	**2006**	**2075.9 (8.2)**	**7861.3 (30.9)**	**12333.2 (48.5)**	**2424.8 (9.5)**	**698.8 (2.7)**	**35.1 (0.1)**	**25429.1 (100)**

Actual length of Classes C and D in 1999	**1169 km**
Actual length of Classes C and D in 2006	**734 km**
Target length of Classes C and D by end 2006	**818 km**
Actual change in length of Classes C and D 1999 to 2006	**- 435 km (-37%)**
Target change in length of Classes C and D 1999 to 2006	**- 351 km (-30%)**

* Figures for 2000 are slightly amended from those previously reported due to the inclusion of a toxic substances classification previously accidentally omitted in one area.

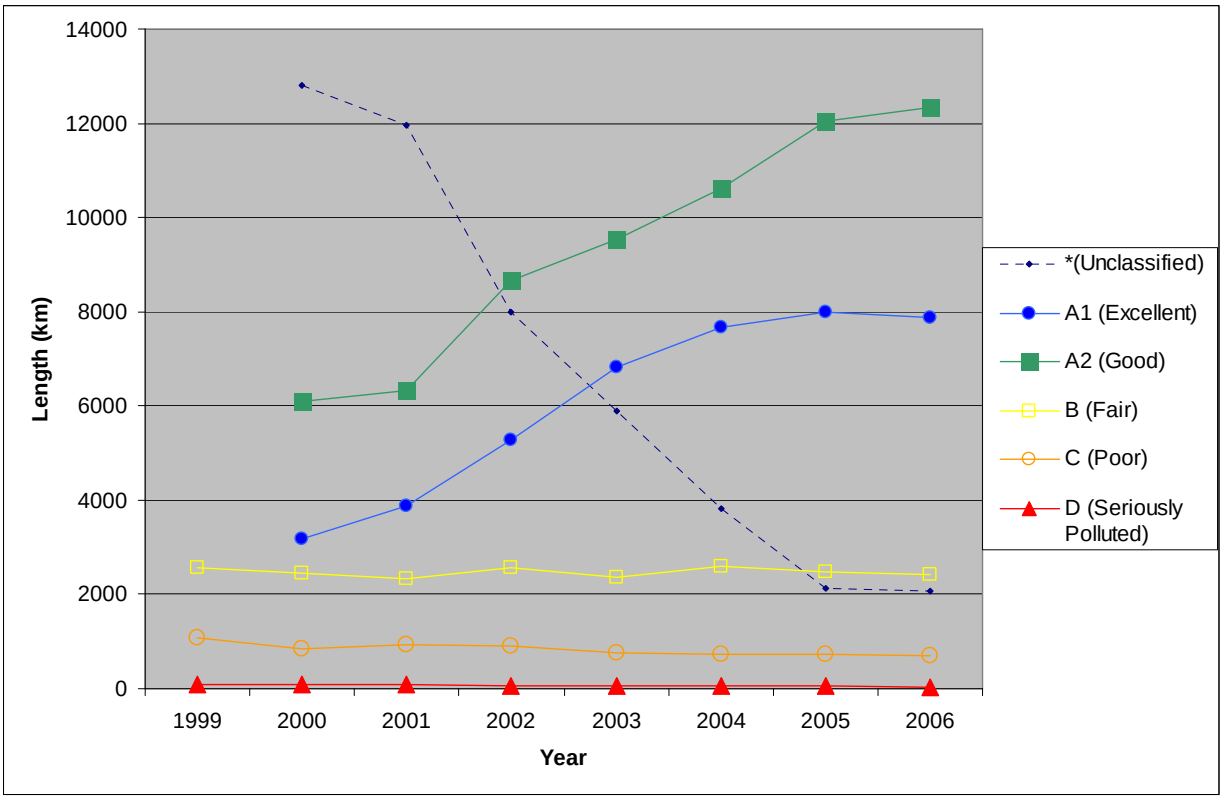

Figure 1: River lengths (km) 1999-2006

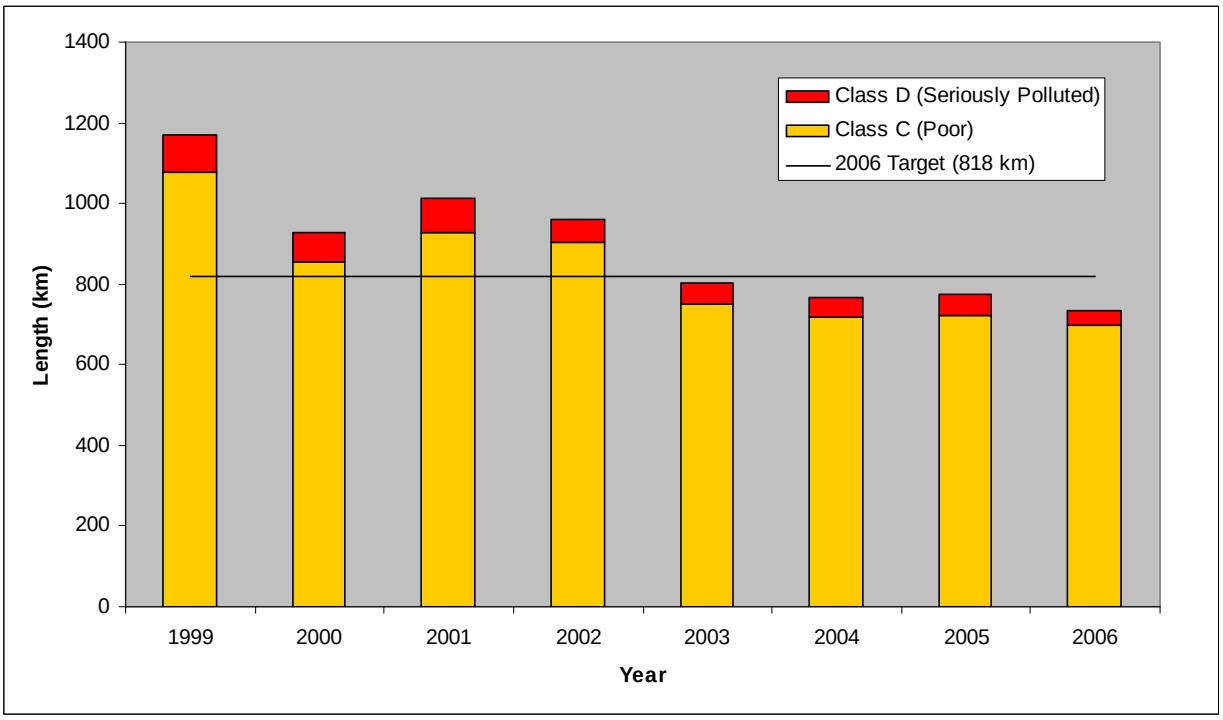

Figure 2: Class C and D river lengths (km) by year and 2006 target

2.1 Improvements in Freshwater Quality

On the Isle of Lewis in the Western Isles the last 0.3 km stretch of the Abhainn a Ghlinn Mhoir, before it flows into Loch Airigh na Lic to the west of Stornoway, has been upgraded from class C to B. This stretch had been consistently class C until 2006 due to leachate from the Bennadrove landfill site. The recent improvement is likely to be due to the installation of a detention tank at the site which ensures that the discharge is made at an even rate throughout the day rather than the batch discharge in operation previously.

In Perthshire, the improvement of 1.1 km of the East Pow from class C to B is due to the completion of improvements at Methven sewage treatment works. The cessation of timber treatment at a timber site may also have had an influence on the improvement though the site has still to be remediated. The improvement in classification, from class C to A2, of 1.9 km of the Lunan Burn immediately downstream of the Loch of Butterstone is attributed to the removal of fish cages from the loch.

In Fife, the improvement from class C to B of a 1.2 km stretch of the Teil Burn is thought to be the result of landfill restoration beginning to have a beneficial effect, though further monitoring will be needed to confirm this. A 2 km stretch of the Kilrenny Burn was also upgraded from class C to B. In this case, this is thought to be the result of the burn stabilising after the adverse effects of housing development in Kilrenny.

Moving across the Forth to the Edinburgh area, closure of the Scotmalt works at Kirkliston was expected to give an improvement in the classification of the last 100m of the Swine Burn before it enters the River Almond. Chemical quality improved but, unfortunately overall quality did not due to the poor aesthetics assessment of the stretch in 2005. The aesthetics have now improved resulting in an overall classification upgrade from class C to A2.

Significant improvements to upstream sewage works have resulted in the upgrade from class C to B of a 2.1 km stretch of the River Almond in West Lothian. However, the full benefits of the works' improvements may not yet be achieved due to the frequency of operation of storm overflows and this is currently under investigation. A further 5.1 km of the River Almond was also upgraded from class C to B due to the overflow situation at East Calder works improving possibly helped by relatively dry weather conditions in 2006. Improved storm sewage control on this stretch of the Almond is required by 2011.

Moving a few miles upstream, a 3.1 km stretch of the River Almond improved from its long-term class C classification to class B in 2006. This was due to an improvement in the biochemical oxygen demand component of the classification. Although the East Calder sewage treatment works on this stretch has a good compliance with final effluent consent standards there are issues with the frequency of storm overflow events. Due to the dry weather in 2006 there may have been fewer storm events thus helping to improve the biochemical oxygen demand component of the classification.

In the Falkirk area, upgrading of 3 km of the Sauchenford Burn from class C to B is thought to be attributable to the current upgrading of Plean sewage treatment works even though the majority of the upgraded parts are not on line yet due to a power problem. Time will tell if the upgrade seen for this stretch in 2006 is maintained and it is possible that further improvements may be seen when all of the upgrades are on line.

In Dumfries and Galloway a significant improvement has been seen in the Buittle Burn. The burn had a classification of class B in 2004 and would have achieved a classification of A2 in 2005 if it had not been for the presence of some sewage fungus across the width of the watercourse leading to an actual classification of class C due to the aesthetics component of the classification. SEPA's regulatory officers on inspecting the watercourse considered the likely cause of the sewage fungus was an agricultural source. As part of the national Diffuse

Agricultural Pollution Environmental Improvement Action, farms in the area were audited and issued with the PEPFA (Prevention of Environmental Pollution from Agricultural Activity) code of practice. These farm visits highlighted any measures needed to reduce run off and any other environmental impact. Further farm inspections are planned in the catchment but those undertaken have obviously already had an impact due to the improved situation with regard to sewage fungus in 2006 resulting in an upgrade to class A2 for the 7.7 km Buittle Burn. The improved classification in the Buittle Burn, and some other stretches, means that there were no class C or D river stretches in the Galloway area in 2006.

The sewage treatment works serving the settlement of Neilston (South of Paisley) has been upgraded. This work involved upgrading the secondary surface aeration plant, installing auto de-sludging and refurbishing all tanks. Work was completed in October 2005. The improvement in the Levern Water, which receives the effluent from the works, was immediate, as illustrated in the ammonia data presented in Figure 3. The improvement has resulted in a 2.4 km stretch of the Levern Water being upgraded from class C to class B in 2006 with the potential for further improvement in the future.

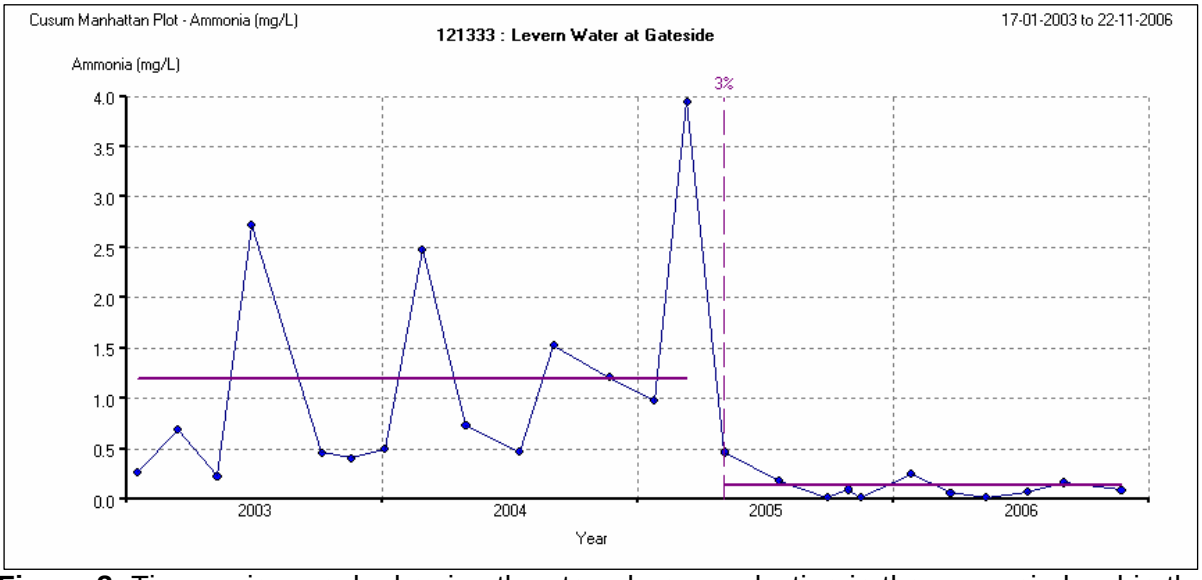

Figure 3: Time series graph showing the step change reduction in the ammonia level in the Levern Water before and after the improvements at Neilston STW

In South Lanarkshire, the Mouse Water catchment, which includes the Dippool Water, has historically been affected by ferruginous (iron bearing) mine water from abandoned mines. The very small iron-rich particles cause a pronounced turbidity in the main river, and in severe cases can coat the riverbed, smothering invertebrates. In previous years, iron levels in the catchment averaged >2.0mg/l, which resulted in SEPA classifying the river as class C. In November 2004 a mine water remediation system, consisting of a settlement lagoon and two reed beds, was completed by the Coal Authority. The treatment scheme removes the iron-rich particles before they enter the river. As a result of this work, and SEPA's continued Environmental Improvement Action Plan, large stretches of the Mouse Water and Dippool Water have improved. In 2005, 6 km within the catchment was upgraded from class C to B and in 2006 a further 7 km improved. This makes the total upgrade 13 km so far and further improvements within the catchment are anticipated in the future. Figure 4 graphically shows the improvement in one of the stretches upgraded in 2006.

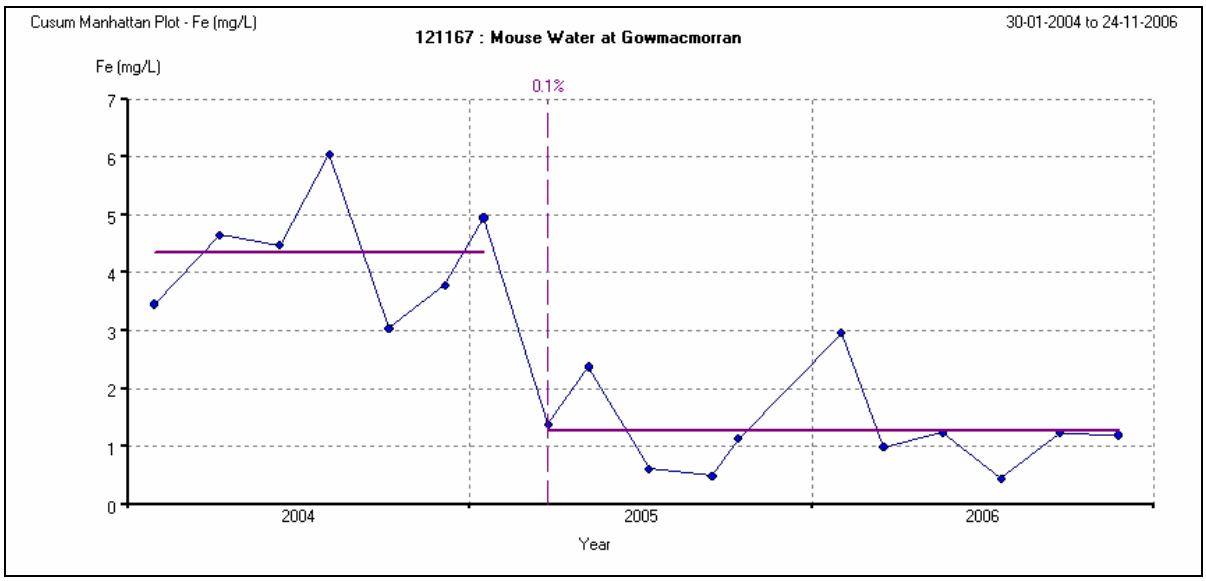

Figure 4: Time series graph showing Iron (Fe) step change reduction in Mouse Water catchment at Gowmacmorran near the town of Forth. Most results are now < 2.0mg/l.

The Duntocher Burn in Dunbartonshire had suffered badly from fly-tipping and deposition of wind blown litter throughout its length. In 2006, the local authority initiated a waste clearance programme for the burn and its tributaries. Since then the aesthetic condition of the embankments and river bed has improved, although some litter was still noted late in 2006. However, due to the actions of the local authority the improvement in the aesthetics led to an upgrade from class C to B for the last 0.5 km of the burn which flows through Dalmuir. Close liaison with the local authority will continue in order to maintain the improved quality of the river. It is noted, however, that in its upper reaches, around Hardgate and Faifley, the burn is also affected by sewage entering the watercourse from intermittent surface drains/pipes. This is especially bad at times of heavy rainfall.

In 2006, the last 2.5 km stretch of the Luggie Water and the final 1.7 km stretch of the Bothlin Burn, both in Dunbartonshire, were upgraded from class C to B. For many years both of these stretches had been receiving organic discharges from several sewage treatment works. The overall improvement in water quality is due to the return of pollution sensitive macro-invertebrates (e.g. mayfly) following the past closures of the sewage treatment works, the last of which closed in 2003. Macro-invertebrates provide information on the long term status of the river because they are slower to react to changes. Their well-being and health will be affected by other factors such as habitat and hydromorphology as well as water chemistry. Upgrades in biological water quality need all the various elements to be working together to provide the correct environment for the invertebrates to thrive. The Bothlin Burn stretch in particular is in the best condition it has been for many years. In both watercourses the aesthetics have also improved. However, there is still evidence of organic pollution reflected by the continued presence of low-scoring invertebrates. Discharges from combined sewer overflows in the area can still cause an impact.

2.2 Poor Quality Freshwaters, and Downgrades

Not all recorded water quality changes were positive. Numerous streams of borderline quality inevitably fluctuate between adjacent classes, but other changes are due to identified causes. This section describes some specific pollution problems and also notes some continuing issues.

On the Isle of Lewis in the Western Isles a 1.9 km stretch of the Abhainn Eirearaigh has been downgraded from class B to C. This may be the result of an increase in the stocking density of fish at the Barvas Hatchery following a change of ownership.

In the Elgin area on the mainland, following a history of class B / A2 classification the last 1.8 km of the Mosset Burn before it flows into Findhorn Bay has been downgraded from class B to C. Possible reasons for this are storm overflows from Forres sewage treatment works and diffuse agricultural pollution. Audit monitoring of the Forres sewage treatment works effluent confirmed that it was in compliance with its authorisation under the Controlled Activities Regulations and limits set to comply with the EC Urban Waste Water Treatment Directive.

Further east, the 6.8 km of the Logie Burn upstream of the A90 road bridge, just to the west of Crimond, was downgraded from class B to C as was a 1.7 km stretch of the Foveran Burn at Mill of Newburgh. In both cases diffuse agricultural pollution is considered to be the likely cause of the downgrades.

In the Spey catchment, the last 0.8 km of the River Dullan, before it flows into the River Fiddich, was downgraded from class A2 to C due to a first time failure of the copper environmental quality standard. The high copper concentration is thought to be due to the discharge from distillery operations south of Dufftown.

Moving south to the Angus and Dundee area, 6.0 km of the Buddon Burn was downgraded from class B to C. This was partly due to a very short term problem at the Wellbank sewage treatment works but mostly due to another pollution source within the catchment. Although a number of premises were inspected by SEPA officers to determine the source, it still remains unknown.

The Den Burn in the Angus and Dundee area was also downgraded from class B to C. In this case it was due to problems at Brechin Distillery with seepage of distillery waste from the foul sewer into a culverted section of the Den Burn which runs parallel to the sewer. Scottish Water should have sealed the manhole but results in December 2006 suggest either a reoccurrence of the problem or potential issues with the operation of the combined sewer overflows on the Brechin sewerage system. Action to solve the problem on the Den Burn will be progressed with the distillery and Scottish Water.

The Lochgelly Burn in the Fife area remained at class D in 2006 (6.6 km). There are still problems of sewage discharges to the Lochgelly Burn particularly during storm events but also due to pump failures from Cowdenbeath's sewage pumping station. The situation will not improve until Scottish Water provides the upgraded sewage disposal system for Cowdenbeath which is currently being designed under Q&S III.

In the Falkirk and West Lothian area, 3.2 km of the Coulston Water was downgraded from class B to C due to a deterioration in the biology component of the classification. This is attributed to the problems experienced at Bathgate sewage treatment works in May and June of 2006 when two routine samples exceeded authorised oxygen demand limits. The exceedences were attributed to the sand filters at the works which required attention. These were subsequently repaired and compliance has since been good.

In Falkirk, 0.6 km of the Bainsford Burn remained at class D. Most of the Bainsford Burn catchment is culverted under a very industrial part of Falkirk. There is often oil and silt present where it emerges near the outfall. A significant amount of time was spent on this problem in 2006 by the local team and it was found that the siphon under the canal was acting like an interceptor, collecting oil which then flushed out on every storm event. As yet the council do not have it on a maintenance programme to periodically get it emptied.

A 0.3 km stretch of the Bowmont Water in the Borders was downgraded from class B to C on aesthetic considerations due to the presence of sewage fungus downstream of the discharge from Yetholm sewage treatment works. Scottish Water is investigating options for improving the outfall to ensure better mixing and thus prevent a reoccurrence. Also in the Borders, the impact of Easter Deans poultry units was responsible for the class B to C downgrade of a 2.5 km stretch of the Eddleston Water. The units now come under Pollution Prevention and Control (PPC) regulation and the impacts will be dealt with by SEPA through PPC licensing.

Over in the south west of Scotland SEPA was alerted in September 2006 to the problem of fungus in the Tacher Burn to the east of Kirkcudbright. The cause of the fungus, which led to a downgrade from class A2 to C, was determined to be liquor arising from a farm midden. SEPA officers met with the farmer on site that day but the pollution had stopped by then. However, the farmer agreed to install a new effluent tank to collect the liquor and thus rectify the problem. A follow up visit by SEPA officers is planned when the new tank has been installed.

In South Lanarkshire, the stretches within the Cander Water, a tributary of the Avon Water, have been classified as class B or A2 for a number of years. However, recently there has been a degradation of water quality of the final stretch; in particular this has been due to increasing levels of ammonia as shown in Figure 5. Coupled with the increasing ammonia levels, there was also a significant reduction in the amount of dissolved oxygen in the river, likely to adversely affect local fish life. This has led to a 1.5 km stretch below Stonehouse sewage treatment works being downgraded from class B to C. This is the first time that the classification has been at this level since 2000. SEPA are currently in discussion with Scottish Water regarding the Stonehouse STW with a view to planned improvements at the works being given increased importance in the Q&S3 investment priority list.

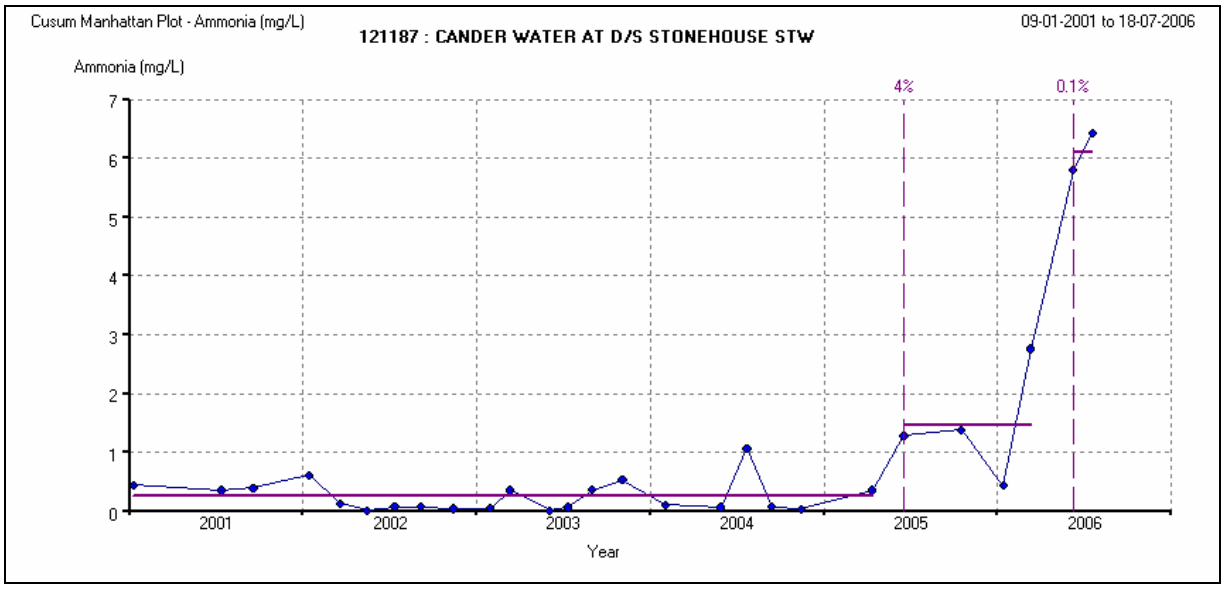

Figure 5: Time series graph of Ammonia levels in the Cander Water stretch downstream of Stonehouse sewage treatment works in South Lanarkshire.

To the north west of Shotts, in September, the Shotts Burn by Salsburgh was polluted by an extremely high biochemical oxygen demand, coupled with an elevated ammonia level which led to a deleterious effect in water quality for 1.3 km. This stretch was consequently downgraded from class A1 to class C in 2006. Although the monitoring site is downstream of Salsburgh sewage treatment works, the effluent from it was within consent conditions during

this period. It was noted however that the monitoring in September took place during a prolonged period of persistent rain and this may well have triggered storm sewer overflows.

Over to the west in the Kintyre peninsula a 2.9 km stretch of the Backs Water was downgraded in 2006 to class C from class B due to low dissolved oxygen levels resulting from farm related pollution. Although farm inspections within the catchments draining to Machrihanish beach have led to improved farm practices, the Backs Water is still a borderline class B/C due to occasional low dissolved oxygen levels, such as those seen in 2006, especially in the summer months.

SEPA will continue to investigate all significant instances of deterioration in water quality. Once the cause(s) is established, then appropriate regulatory, monitoring or 'environmental improvement plan' actions will be taken with a view to delivering recovery. SEPA has developed strong partnerships with a number of stakeholders and external organisations to raise awareness of water quality issues. The help of others is often required to devise or implement solutions to improve the water quality for specific stretches where the work required is non-regulatory. These partnerships are expected to become even stronger as work progresses to implement the Water Framework Directive.

3. Estuarine Water Quality

Estuarine water quality data for 1999 – 2006, is shown in Table 2. In 2006, excluding the Montrose Basin, there was a small upgrading of 0.6 km^2 from class C to class B, and a larger upgrading of 8.9 km^2 from Class B to Class A.

The Montrose Basin is considered separately because until 2006 it has always been listed as 'Class A'. This has now been changed, primarily as a result of the 2006 OSPAR procedural review of eutrophication status and the EC Urban Waste Water Treatment Directive review. These reviews, which used the recently available EC Water Framework Directive criteria, rather than the SEPA classification scheme, showed that the Montrose Basin should be regarded as moderate to poor, and hence class C, as eutrophication criteria were being exceeded based on the level of nutrients, algal cover, algal biomass and secondary effects on invertebrate populations.

The survey work on whose results the review was based was started in 2001, so SEPA has taken the decision to retrospectively downgrade Montrose Basin to class C all the way back to 2001, although there is no evidence that quality in 2001 was different from the 1999 baseline year. Re-examination of SEPA's historical (pre-2001) algal data shows marked stability in the status of the basin based on algal cover since 1991. Although only one component of the assessment criteria (others include algal biomass and secondary influences on the macro-invertebrate populations) the constant level of algal cover (c. 23%) since 1991 is sufficient evidence to justify a retrospective reclassification of the Basin as class C back to 1991.

As noted in water quality reports in previous years, weather can have a significant impact on the classification of estuarine waters. Wetter weather, as in 2002, results in higher river inflows to the major estuaries and consequent higher dilution and greater mixing, which in turn improves dissolved oxygen levels and potentially the classification. Due to these clearly weather induced changes a three year average figure of the total area of class C and D estuarine waters gives a clearer picture of change in these waters over time as shown in Figure 6. The slow reduction in the total of class C and D waters reflects the problems in addressing current and historically related pressures in some of Scotland's transitional waters. Although much can be done to improve diffuse pollution and the quality of current discharges, unfortunately, the sediments of Scotland's major industrialised estuaries will continue to carry a burden of organic matter and some toxic contaminants from historic discharges for many years to come and will thus continue to influence the classification of parts of some estuaries.

3.1 Improvements in Estuarine Water Quality

The main storm overflow for the town of Tain, which discharges to the Dornoch Firth, is now screened. This work has resulted in 0.3 km^2 of the firth being upgraded from class B to class A in 2006.

The water quality in the Clyde estuary improved in 2006 with reductions in class B and C waters and an increase in class A. In the area around the mouth of the River Leven 6.5 km^2 was upgraded from class B to class A due to high flows increasing dissolved oxygen levels. The upper Clyde (2.45 km^2), however, retained its class C designation for 2006 due to the poor flushing mechanism of the upper estuary. Historical chromium contamination manifested itself in some high levels being recorded although the EC Dangerous Substances Directive limit has not been breached.

Table 2: Estuarine water quality classification for the years 1999 to 2006

	Year	A Excellent	B Good	C Unsatisfactory	D Seriously Polluted	Total
Area km^2	1999	633.3	143.6	31.6	0.9	809.4
(%)		(78.2)	(17.7)	(3.9)	(0.1)	(100)
Area km^2	2000	637.0	132.9	38.2	1.2	809.3
(%)		(78.7)	(16.4)	(4.7)	(0.1)	(100)
Area km^2	2001	661.1*	115.5*	31.8*	1.1	809.5
(%)		(81.7)	(14.3)	(3.9)	(0.1)	(100)
Area km^2	2002	644.7*	140.7	23.1*	0.8	809.4
(%)		(79.6)	(17.4)	(2.9)	(0.09)	(100)
Area km^2	2003	651.1*	121.9*	35.5*	0.9	809.4
(%)		(80.4)	(15.1)	(4.4)	(0.1)	(100)
Area km^2	2004	687.7*	92.3	29.3*	0.2	809.5
(%)		(85.0)	(11.4)	(3.6)	(0.02)	(100)
Area km^2	2005	684.0*	95.0	30.1*	0.2	809.5
(%)		(84.5)	(11.7)	(3.7)	(0.02)	(100)
Area km^2	**2006**	**693.8**	**86.1**	**29.5**	**0.2**	**809.5**
(%)		**(85.7)**	**(10.6)**	**(3.6)**	**(0.03)**	**(100)**

Actual area of classes C and D in 1999	**32.5 km^2**
Actual area of classes C and D in 2006	**29.7 km^2**
Target area of classes C and D by the end of 2006	**26.0 km^2**
Actual change in area of classes C and D 1999 to 2006	**- 2.8 km^2 (-8.6%)**
Target change in area of classes C and D 1999 to 2006	**- 6.5 km^2 (-20%)**

*2001-2005 figures have been corrected relative to earlier SEPA publications to take account of the decision to retrospectively downgrade Montrose Basin to class C as a consequence of the 2006 OSPAR and EC Urban Waste Water Directive reviews of the Basin. This has led to 8.5 km^2 being downgraded from class A/B to C between 2001 & 2003 and 8.4 km^2 being downgraded from class A to C in 2004 & 2005 (0.1 km^2 was separately classified 2004 onwards). Classification of Montrose Basin before 2001 has been left as class A (8.5 km^2).

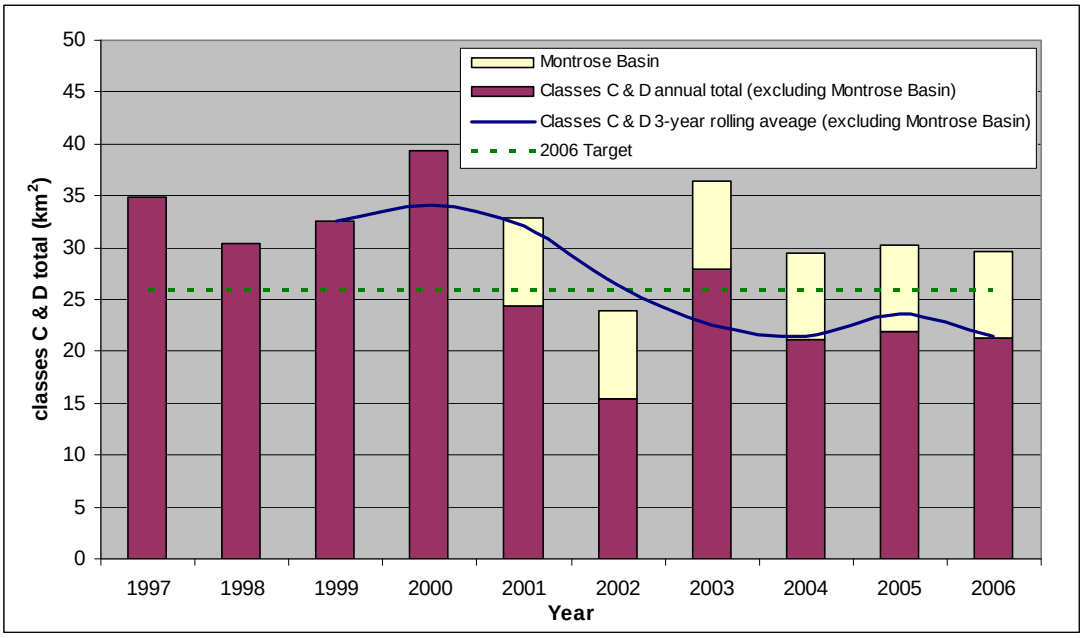

Figure 6: Annual totals and three year rolling average for class C and D estuarine waters.

An improvement in the aesthetics of the Clyde estuary stretch between Erskine and Milton enabled 2.6 km^2 to be upgraded from class B to A. This resulted from an upgraded system at Bowling where sewage is now screened and transferred via a pumping station. High flows were reflected by much improved dissolved oxygen levels in the middle estuary between Dalmuir and the Leven confluence. In addition, the foaming problem at Dalmuir sewage treatment works was much improved, and 0.7 km^2 was upgraded from class C to B.

Staying in the Clyde, combined sewer overflows from Rhu Road Higher are now screened with telemetry present at pumping stations within this stretch. There has therefore been a reduction in discharge of screenings to the Clyde estuary from these upgraded combined sewer overflows. One downside of this has been the increase in screenings passed to Craigendoran Pumping Station (which collects and pumps on to Helensburgh sewage treatment works). This has caused an increased frequency of chokes in the station pumps. Scottish Water is looking to resolve this issue during 2007.

Moving to the Gare Loch, an improvement in aesthetics was recorded at Rhu Narrows leading to a 0.3 km^2 upgrade to class A from class B. The improvement is due to Scottish Water having fitted a tideflex at the most southerly Shandon tank to prevent tidal ingress and washout of solids from it. In the future Scottish Water intends to upgrade all other tanks where tidal and/or surface water ingress is an issue.

3.2 Poor Quality Estuarine Waters and Deteriorations

On the east coast, Montrose Basin, which covers an area of 8.4 km^2, has been downgraded from class A to class C in 2006. This downgrade does not reflect a deterioration of the Basin in 2006, but rather the result of having new WFD classification criteria and better information available to inform the classification after the results of a series of surveys to assess macro-algal coverage became available. The eutrophication status of the basin had been a concern for a number of years as the physical characteristics of the basin make it susceptible to algal growth. The presence of nitrate promotes this growth with the River South Esk being the main source of nitrate to the basin. The area surrounding the basin was designated a Nitrate Vulnerable Zone in 2003. Nitrate and other pollutants coming from the catchment should decrease in the coming years following implementation of Nitrate Vulnerable Zone measures by the Government. The Montrose Basin has also been designated as a Problem Area by the recent OSPAR Comprehensive Procedure review on the basis that nutrients, algal cover and biomass exceed OSPAR eutrophication criteria.

In the west, a small area (0.1 km^2) of the Leven Estuary in Dumbartonshire has been downgraded from class B to C due to complaints of sewage near the barrage.

As described in previous reports, the naturally poor flushing mechanisms of the main Clyde Estuary, make it susceptible to organic inputs. Low river inflows in dry weather lead to partial stagnation of deep waters in the upper estuary, which become starved of oxygen. The extent of the area in class C due to this cause was unchanged in 2006.

4. Coastal Water Quality

2006 saw a further reduction of 22 km in the length of class C and D coastal waters. Consequently, as shown in Table 3, the headline length of unsatisfactory coastal waters has been reduced by nearly 72% since 1999; down from 321.6 to 90.5 km. This means that the 2006 target which was to reduce the total down to 176 km has been very significantly exceeded. The substantial improvement in the total of class C and D coastal waters since 1999 is primarily due to the big improvements in the treatment of sewage discharges which has been delivered by Scottish Water's ongoing capital investment programmes (currently Q&S3 which started at the beginning of 2006), as well as work to reduce diffuse inputs such as agricultural pollution. As a result of these continuing programmes, further improvements in the quality of coastal waters are expected in the future.

Presenting coastal waters quality trends as a three-year rolling average of the total length of class C and D waters smoothes out the obvious influence of particularly wet or dry years as shown below in Figure 7. It is encouraging to note that the rolling average has continued to decrease in 2006 as it has done every year since 2000.

Table 3: Scottish coastal waters classification for the years 1999 to 2006

	Year	A Excellent	B Good	C Unsatisfactory	D Seriously Polluted	Total
Length km (%)	1999*	10906.4 (92.4)	569.4 (4.8)	271.3 (2.3)	50.3 (0.4)	11797 (100)
Length km (%)	2000†	10979.8 (93.1)	556.3 (4.7)	224.7 (1.9)	37.1 (0.3)	11798 (100)
Length km (%)	2001	10995.9 (93.2)	559.7 (4.8)	217.5 (1.8)	24.8 (0.2)	11798 (100)
Length km (%)	2002	11032.4 (93.5)	549.6 (4.7)	191.6 (1.6)	22.9 (0.2)	11796 (100)
Length km (%)	2003	11080 (94.0)	566.5 (4.8)	127.7 (1.1)	22.3 (0.2)	11796 (100)
Length km (%)	2004	11091.1 (94.0)	568.3 (4.8)	123.6 (1.0)	11.6 (0.1)	11794.6 (100)
Length km (%)	2005	11102.9 (94.1)	579.0 (4.9)	101.6 (0.9)	11.2 (0.09)	11794.8 (100)
Length km (%)	**2006**	**11114.2 (94.2)**	**591.1 (5.0)**	**80.5 (0.7)**	**10.0 (0.09)**	**11795.7 (100)**

Actual length of Classes C and D in 1999 **322.0 km**
Actual length of Classes C and D in 2006 **90.5 km**
Target length of Classes C and D by end 2006 **176.0 km**

Actual change in length of Classes C and D 1999 to 2006 **- 231.5 km (- 72%)**
Target change in length of Classes C and D 1999 to 2006 **-145.0 km (- 45%)**

*1999 figures have been corrected relative to some earlier SEPA publications to take account of data for some islands which was unavailable at that time.
†Relative to previous annual reports, length of class A reduced by 4.8 km, and class B by 1.5 km to eliminate double counting of Tyne estuary.

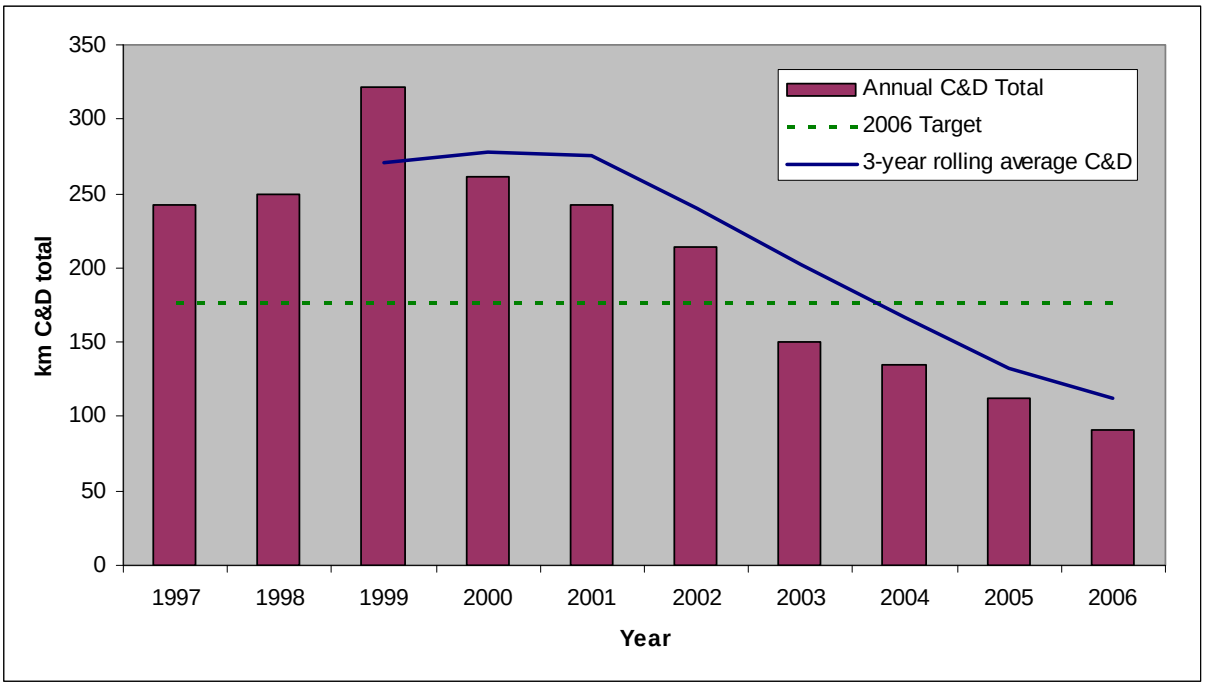

Figure 7: Annual totals and three year rolling average for class C and D coastal waters.

The summer of 2006 was particularly notable for the results achieved at Scotland's designated bathing waters. For the first time, every one of them met the mandatory European quality standards, despite an increase of 3 in the number of designated bathing waters to total of 63. Of the 63, 34 also met the more stringent guideline quality standards. Further information on Scotland's designated bathing waters can be obtained from SEPA's 2006 Scottish Bathing Waters report (http://www.sepa.org.uk/publications/bathingwaters/index.htm).

4.1 Improvements in Coastal Water Quality

In the Western isles, stretches at Bayhead, North Uist (0.3 km) and Leverburgh on the Isle of Harris (0.1 km) were upgraded from class C to A after recent inspections confirmed no sewage debris was present. The stretches at Coll (0.1 km) and Crossboat (0.1) on the Isle of Lewis as well as Ashdail Cottages, North Uist (0.1 km) were also upgraded from class C to A after recent inspections confirmed there was no sewage debris on them from local septic tanks.

The installation of a new septic tank in 2006 enabled Eurodale, Isle of Lewis (0.5 km) to be upgraded from class C to A. Also on Lewis, class C to A upgrades were obtained at Dell (0.5 km), Shaker (0.5 km) and Vatisker (0.3 km) following the installation of new septic tanks and combined sewer overflows. A new septic tank was also installed at Bragar (0.5 km) but the discharge is still to the beach above mean low water mark so the upgrade was only from class C to class B.

Moving to the mainland the commissioning of a new sewage collection system, pumping station and sewage treatment works led to the upgrade 1.6 km of coastline at Ullapool from class C to A. Further north, a previously badly polluted 0.2 km stretch at Kinlochbervie Harbour was upgraded from class D to B after inspections confirmed the less frequent nature of oil spills. Liaison with harbour staff has also helped reduce the amount of litter.

On the North coast at Durness the 1.0 km stretch at Sango Sands has been upgraded from class C to B following installation of a new sewage treatment works to replace the old septic tank that discharged above the mean low water mark. Thurso Harbour (0.1 km) was also upgraded from class C to B as storm overflows are now screened and spilling less frequently following the completion of the new sewage treatment works to the east of the town.

To the east of Inverness, the East Beach at Nairn (1.0 km) and Stonehaven Beach (0.7 km), further south, were both upgraded from class C to B upon passing the designated bathing water mandatory standards in 2006 after having failed them in 2005. A new septic tank was also installed at Sandend and Sandend Bay (0.6 km) was upgraded from class C to class B on the basis of lower recorded concentrations of indicator bacteria, within EU standards.

On the northeast coast between Sandend and Aberdeen a number of stretches were upgraded from class C to B for a variety of reasons. Gamrie Bay (1.6 km) benefited from the new membrane filtration plant installed at Gardenstown and inspection showed that no further pollution was being caused at Phingask (0.1 km) after repair of an unauthorised surface water outfall. At Inverallochy (0.1 km) sewage is now pumped to Phingask sewage treatment works. At Maut Craig by Crimond (1.5 km) and Scotstown Head (0.8 km) the upgrade was the result of the appropriate sewage treatment being provided under the terms of the Urban Waste Water Treatment Directive. At Sandford Bay and Boddam (3.8 km) underwater video in 2006 showed no evidence of gross pollution from two major discharges from Burnhaven sewage treatment works and Thistle Seafoods Ltd, Boddam. Finally the Mouth of Don (1.8 km) was upgraded due to the reduction in sewage solids and bacteriological loading from the River Don.

Further south in Fife a stretch at Anstruther Billowness had been downgraded to class B in 2005 due to the presence of sewage debris on the beach despite achieving guideline EU standards. The sewage debris didn't occur in 2006 so this 0.6 km stretch was upgraded to class A in 2006. Further along the coast towards Kirkcaldy a new primary sewage treatment works and long sea outfall was commissioned in April 2006 at West Wemyss. This has stopped the continuous discharge of untreated sewage that locally downgraded this stretch of the Fife coast and should result in an improvement in water quality in future years. The discharge was the last remaining untreated continuous sewage discharge of any significance along the whole Firth of Forth coastline.

In the Edinburgh area, Fisherrow West (0.5 km), by Musselburgh, improved to meet EU standards in 2006, so was upgraded from class C to B. Further East along the coast the EC bathing water at Seaton Sands (3.1 km) was upgraded to class A from class B on achieving the more stringent guideline standard rather than the mandatory one as in 2005. The faecal coliform sources to Seaton Sands were investigated during the 2006 bathing water season. Though some elevated faecal concentrations were found in the Canty Burn, it was not possible to determine if this was the source of the problem in 2005. The Canty Burn is now sampled at the same time as bathing water samples are collected to provide additional information should any future problems arise. Work to eliminate overflows from dual manholes in the Canty Burn catchment is continuing. Moving further east, the identified bathing water at Yellowcraigs (0.3 km) was also upgraded to class A from class B on achieving the guideline standard rather than the mandatory one as in 2005. The problem in 2005 was traced to contamination from faulty drainage to a septic tank which was rectified shortly after the failure occurred.

In the Borders, the 0.7 km stretch of bathing water at Eyemouth was upgraded to class B from class C due to achieving the mandatory standard having failed it in 2005. Scottish Water investigated possible sources of faecal contamination in the North Burn but none were detected. The bathing water is still at risk from agricultural impacts in the Eye catchment, though as part of a SEPA environmental improvement action plan, carried out in 2005 an 2006, awareness of the issue was raised within the agricultural community. The sewage

discharge from Ayton sewage treatment works was removed from the Eye at the turn of 2005/2006 and is now pumped to the works at Eyemouth. This will significantly reduce faecal contamination entering the Eye water and hence the bathing water at Eyemouth. Also at Eyemouth, a 0.13 km stretch at Gunsgreen was upgraded from class C to class B in 2006 following assessment that the marine ecosystem had almost recovered from damage caused in 2002 by the accidental over-chlorination of sewage effluent. Chlorination was permitted at that time to protect the bathing water pending completion of the sewage treatment and outfall schemes. It is hoped that biological recovery should be complete in 2007 so that this stretch can then be upgraded to class A.

In southwest Scotland, the welcome statutory phasing out of Tributyl Tin (TBT) as an anti-foulant on ships is continuing to give positive environmental benefits. There were marked improvements in 2006 to stretches in Loch Ryan downgraded by TBT impacts in past years. Thus, due to the reduction in imposex levels seen in dog whelks, 6.2 km of class B and 1.85 km of class C have been upgraded to class A in 2006.

On the Isle of Arran there was a marked improvement in the aesthetic quality recorded at Blackwaterfoot such that the 0.6 km stretch could be upgraded from class B to A. Still on Arran new sewerage systems have been installed and old septic tanks or crude outfalls removed at Blackwaterfoot, Lamlash and Brodick, Further north on the isle of Cumbrae, sewerage improvements in the town of Millport have resulted in the removal of several public septic tanks in the area.

Moving north to Argyll, at Garroch Head there has been some recovery from historical impacts on the sediments and their animal communities originating from the spoil dumping grounds. This has led to 2.5 km of class C and 1 km of class D stretches being upgraded to class B in 2006. Recovery was observed at the sites of three fish farms; Bagh Dail nan Ceann, Loch Spelve B (Isle of Mull) and Ardchatten in Loch Etive which collectively allowed 0.3 km to be upgraded from class B to class A in 2006.

4.2 Poor Quality Coastal Waters and Deteriorations

A 0.2 km stretch at Isle Ornsay, Isle of Skye and a 0.5 km stretch at Dornie, Loch Long were both downgraded from class A to C in 2006 due to substantiated complaints of sewage solids being present. First time sewerage is required at both locations.

On the east coast of the mainland in Angus water quality at St. Cyrus remained at class C in 2006. However, it is expected to improve in 2007 as the South Kincardine Drainage Scheme was commissioned in October 2006 and sewage from St. Cyrus is now pumped to Benholm for treatment. Further south in Fife, Lower Largo (0.2 km) was again downgraded to class C due to an inadequate outfall.

In the south west, benthic impacts, as a result of Stranraer's sewage treatment works, contributed to a downgrade of 0.9 km of Loch Ryan to Class C. Further North in Argyll, new data enabled 10 fish farms to be classified as class B, adding an extra 1 km to the total length of coastal waters classified in 2006.

5. Conclusions

2006 saw further improvements in river and coastal water quality across Scotland and the 2006 targets for reductions in the total of class C and D waters were comfortably met.

Looking beyond the one-year changes and classification fluctuations, some of which are affected by uncontrollable factors such as rainfall, good long-term improvement continues to be evident. More new sewerage infrastructure and sewage (and other effluent) treatment schemes are being built or are planned, which will provide further quality benefits. SEPA is also maintaining its programme of Environmental Improvement Action Plans, many of which are directed at problems arising from more diffuse, currently unregulated sources. These will also produce environmental quality improvements. Other initiatives such as improvements in, and better implementation of, codes of best practice such as the "Prevention of Environmental Pollution from Agricultural Activity" (PEPFAA) code, "Forest and Water Guidelines" and the Scottish Executive's 4-point plan to minimise pollution from livestock are helping to reduce rural impacts. Current EC Common Agricultural Policy (CAP) reform proposals also appear likely to eventually deliver some environmental quality improvements. Equally importantly, pollution from new urban area developments is being minimised from their inception by the planning and incorporation of "Sustainable Urban Drainage Schemes" (SUDS), to avoid the problems caused by both combined sewer overflows and contaminated surface water run-off.

It is recognised that much remains to be done to bring the quality of all waters up to desired standards, and this ongoing work is being given fresh impetus by the current implementation of the requirements of the EC Water Framework Directive. This Directive will increasingly influence all water and water habitat improvement programmes. It has already resulted in the introduction of new regulatory regimes for abstractions and engineering works, thereby bringing under control many activities which impact on ecological quality, but which have not previously been subject to direct regulation. Scotland's waters remain a valuable resource for fish and wildlife, recreation, the transport of well-treated wastes, abstraction and power generation. SEPA aims to ensure through its policies and actions that the future for the quality of all waters and aquatic environments remains positive, and that current improvement trends are maintained, for the enhancement of all uses and benefit of users.

6. Future Quality Assessments

The river and coastal results reported here are now all available via SEPA's web-site GIS which includes location search facilities (see: http://www.sepa.org.uk/rqc/map.asp). Future water quality work will be increasingly dominated by the continuing implementation of the Water Framework Directive (WFD). To meet the requirements of the WFD, SEPA has had to make large changes to its monitoring network which will mean that in 2007 and beyond it will no longer be possible to compare wholesale the assessments made in these years with those of 2006 and earlier. It envisaged, however, that a limited comparison will be made for a selected number of monitoring sites.

Information on WFD and reports outlining the first WFD "characterisation" of all relevant Scottish waters are available on SEPA's web-site, backed up by database search facilities (see: http://www.sepa.org.uk/wfd/index.htm). It is inevitable, for various reasons, that the characterisation reports present an apparently less rosy view of the quality of our water environment. The most significant reason for this less positive view is the wider range of pressures which have to be considered for the purposes of the WFD. The assessments reported in this and previous SEPA water quality reports concentrate mainly on the effects of discharges and diffuse inputs of potential pollutants. For the WFD, account is also taken of water abstractions, impoundments and engineering works such as river straightening and flood defences, which may also impact overall ecological quality in ways not measured by the current classification schemes.

Also very significant is the fact that the WFD characterisation is a risk assessment, rather than a classification (though the two are linked), and that the WFD "good status" quality target is defined by the Directive as being well up the quality spectrum. It is appropriate that a slightly precautionary estimate of this quality target has been taken at the characterisation stage, particularly in respect of the less well understood hydrological and engineering pressures.

Finally, characterisation assessment by water bodies, rather than by the stretches currently classified has some effect. The current stretches are sometimes quite short (perhaps between a discharge point and confluence with a cleaner or larger stream), whereas the WFD water bodies are mostly larger, and take the overall quality of the poorest stretch within them. This implies that a 3 km currently poor stretch could result in the whole of a 10 km water body failing to meet WFD quality standards.

End.