

**NATIONAL TECHNICAL ADVISORY GROUP ON FLOODING ISSUES
MAPPING AND HYDROMETRIC ISSUES SUB-GROUP**

SEPA Hydrometric Data

Background

River Level and Flow

1. The growth in the river gauging network has been driven by changes in legislation, changes in administrative structures and the availability of resources associated with these changes. These three elements are generally inter-dependent.
2. Following the Rivers (Prevention of Pollution (Scotland) Act 1951) a number of River Purification Boards were established, mostly in southern Scotland. This led to an expansion in the network in these areas as it gave them the power to monitor flow to allow them to perform their function (i.e. control pollution). However, the growth in the network nationally during this time reflected the variable rate of establishment of the River Purification Boards through the 1950's and early 1960's. This resulted in an unbalanced distribution of monitoring by the 1960's. In 1963 the Working Party on River Survey and Gauging was able to take a national perspective of the network (and promoted a national gauging programme).
3. In 1975 the re-organisation of RBPs led to a transfer of stations built by SDD (primary for yield assessment) to the RPBs. The 1982 transfer of responsibility for provision of flood warning schemes to the RPBs led to the installation of a number of new stations higher up catchments.
4. Sites built for pollution control tend to be located in or around urban centers, yield assessment sites are in areas with hydro potential, compensation sites are located in areas where supply reservoirs are prevalent (Highlands, Tweed and some in Clyde and Forth). Abstraction monitoring is limited, but monitoring of irrigation abstraction was developed for the Ordie and Peffer burns in Tayside and Lothian following their designation as Control Areas under the Natural Heritage (Scotland) Act 1991. Sites implemented following the adoption of The Convention for the Protection of the Marine Environment of the North-East Atlantic in 1992 (OSPAR) are designed to support the monitoring of riverine contaminants to the marine environment.
5. SEPA inherited its monitoring networks from the River Purification Boards in April 1996. Although the network had evolved to meet a number of needs (water resources, water quality, flooding etc.) SEPA was given no existing duties or powers to manage water resources beyond its general duty with respect to water in the Environment Act 1995.
6. SEPA has the discretionary power to assess flood risk and a duty to advise local authorities on flood risk. In addition, discretionary powers to implement flood warning schemes were provided to Local Authorities in Part VI of the Agriculture Act 1970.

These powers were transferred to the Regional and Islands Councils by section 137(2) of the Local Government (Scotland) Act 1973, and thereafter to the River Purification Authorities by section 21 of the Local Government and Planning (Scotland) Act 1982 along with an additional requirement that, before exercising such powers, the River Purification Authorities would consult with appropriate Local Authorities and Chief Constables. Transfer of the powers to SEPA was made under section 21 of the Environment Act 1995.

7. There are a number of other duties and powers which act as drivers for hydrometric data. For example, for SEPA to discharge its responsibilities under the Control of Pollution Act 1974 it is necessary to understand the flow regime sufficiently in order to define the conditions to be placed upon any discharge consent.

8. In addition to operating its own sites, SEPA obtains data from a number of sites operated by hydro-power authorities across Scotland (mostly Scottish and Southern Energy (SSE) but also some smaller private ones)

Rainfall

9. The Met Office is the legal successor to the British Rainfall Organisation. SEPA either makes, or arranges for the taking of, rainfall and climatological observations which are subsequently sent to the Met Office's Scottish Weather Observations Centre (SWOC) in Edinburgh. These observations are then quality controlled, archived and a copy returned to the originator. All quality controlled data are Crown Copyright. Inspections of the rainfall sites and raingauges are carried out by Met Office staff based at SWOC. Maintenance and replacement of many of the raingauges in the network is undertaken by, and at the expense of, SEPA.

10. In order to gain maximum benefit from limited resources, SEPA and the Met Office collaborate on determining the location of rainfall and climate sites both to reduce duplication and to ensure that these sites meet the National network requirements. SEPA and Met Office requirements may differ in certain respects and, in certain circumstances, SEPA may wish to establish stations which would not be required by the National network.

11. Two Memoranda of Understanding were signed between SEPA and the Met Office in 1997. The first one (SEPA Policy 23) sets out the arrangements for the transfer of data between the two organizations. The second one (SEPA Policy 33) sets out the arrangements for resourcing and managing the network of rain gauges.

12. Since the mid 1980's as telemetry systems were developed by the RPBs intensity rain gauges were installed by RPBs (largely to meet the needs of flood warning). More recently, since 2000 SEPA have installed a number of telemetry rain gauges to allow SEPA to support SEPA's work with respect to Bathing Waters.

Current Networks

13. SEPA operates 412 sites monitoring river and tidal levels across Scotland. Table 1 gives a break down of the active sites according to SEPA operating area and start date.

Area	River	Others ¹	<1950	<1970	<1990	<2004	Others ²
HIG	119	8	3	22	71	125	2
SE	161	2	3	45	105	139	24
SW	110	12	1	39	82	121	1
Total	412	22	7	106	258	385	27

(HIG = Highlands, Islands and Grampian; SE=South East; SW=South West)

¹ Loch, canal and tidal level monitoring sites

² Sites with unknown or uncertain start dates

23 (6%) of the river gauging stations are uncalibrated level only sites.

The map given in Annex 1 gives the spatial distribution of SEPA sites.

Data Management

14. SEPA operates two data management systems that are supported by 5 databases. The last in-house system was decommissioned in 2003 and replaced by a proprietary Hydrological Information Management System (HIMS).

Although the two systems differ in their interfaces and functionality, the hydrological functionality is broadly similar.

Raw data is imported via telemetry or uploaded from a PC

Sub-daily data is quality controlled each day

At the end of each month all data is quality controlled, derived data is archived (e.g. daily mean flows) and long term statistics up-dated.

Gaugings are uploaded throughout the year

Ratings will be reviewed if deviations are observed during the year

At the end of each year records are reviewed and ratings revised if necessary

Sub-sets of data are sent to CEH each month for the Hydrological Summaries and complete sets for all primary sites by March for inclusion in the Hydrometric Register and Statistics.

Rainfall data submitted to Met Office monthly

Quality Control and Assurance

15. SEPA are the only UK hydrometric authority that are accredited for ISO:9000:2000. All hydrometric activities are covered by quality procedures. As a

consequence, SEPA are audited annually as well as maintaining a system of internal audits to monitor performance.

16. The quality procedures are prescriptive documents that describe a specific activity using a step-by-step approach. The procedures generally refer to the appropriate international standards as the source for our methods.

17. In addition, SEPA have signed a service level agreement with the National River Flow Archive (NRFA) for the supply of hydrometric data. This agreement acts as an incentive for SEPA to provide data promptly and to ensure that the number of queries raised by NRFA (generally related to quality control issues) are minimal and that they are dealt with rapidly.

Accessibility

18. Access to data from 326 SEPA sites is available via the National River Flow Archive web site data (http://www.nerc-wallingford.ac.uk/ih/nrfa/gauging_station_network/index.htm).

19. Data for 153 sites and for 14 rivers are included in the annual and monthly CEH hydrological summaries.

20. SEPA provide access to near real-time river level data at 90 water level sites via a web page on the SEPA internet site. The last 2 days of data are displayed each morning showing current trends. This web site was launched to meet the needs of a range of leisure users including fishermen and canoeists. The site is reviewed every 6 months.

21. SEPA are on the Project Board of the UK Hi-Flows project. The data-gathering phase is complete and the contractor has submitted their report to the Project Board. There will be 155 SEPA sites on the database. The development of a public access web site to give open access to data (POT, AMAX, quality measures and site descriptions) is in progress. The launch date for the web site has slipped from February 2004 and SEPA is waiting for a confirmed date. This database will be essential for anyone carrying out flood estimation using the Flood estimation Handbook in the UK. It provides the most up to date quality controlled series of AMAX and POT data. In addition, it gives a quality flag that indicates whether or not a site is suitable for inclusion in a pooling group analysis. This project will lead to substantial improvements in the database used to support the Flood Estimation Handbook including:

32,342 station years (23,410 in FEH)
1018 stations (1000 in FEH) potential to add more
31.8 years per station (23.4 in FEH)

22. There is no open external access to real time data at this time. The limitations to this are the current logging and telemetry systems and the potential for conflict with high priority activities such as flood warning. SEPA does allow independent access to a

limited number of gauging stations to SSE for flood warning information on the basis of reciprocal access to SSE reservoir level information.

23. SEPA has entered into contractual agreements with third parties to provide real time level information at selected sites (e.g. Fish Tweed). These agreements recover SEPA's costs and put in place conditions to protect SEPA's interests.

24. All hydrometric information held by SEPA is accessible by the public upon request. There is generally only a small charge for this data associated with staff time.

25. SEPA endeavor to collate information (using GIS) on flood events such as the extent, location and impact after events and as historic data becomes available. Historically this activity has been limited by resource. This information, together with the local knowledge of staff are used to provide advice to local authorities and any other parties requesting information from SEPA.

The Future

26. Future developments of the network will be driven by two primary drivers: WEWS Act and flood warning.

27. The WEWS Act and any associated secondary legislation (e.g. abstraction regulations) are drivers for the acquisition of hydrometric information. The establishment of a Scottish Monitoring Strategy (SMS) by December 2006 and the introduction of abstraction, impoundment and river engineering regulations in 2005 will all influence the monitoring of level and flow in Scotland.

28. SEPA has formed an internal task group to consider the SMS and will shortly be forming a stakeholder group to take this issue forward.

29. New flood warning schemes require network enhancements. For example, a new station will be built on the Clyde near Abington as a part of the Clyde flood warning scheme. It is SEPA's policy to rely on local authorities to formally request a flood warning scheme prior to progressing a case for funding. SEPA is currently working with Aberdeenshire and Angus councils to consider the potential for new flood warning schemes.

30. Instrumentation is an area of continuous development. SEPA have 5 ultrasonic gauging stations and have recently purchased an Acoustic Doppler Profiler (ADP) and a side-looking Doppler. All of these technologies aim to give an accurate and reliable means of directly measuring flow. SEPA continue to explore developments in this area and will purchase a second ADP this month. Experience has shown that these technologies require highly skilled staff who are fully versant with the equipment and its limitations. While ADP have proved to be very accurate SEPA have encountered logistical difficulties in getting the instrument across high velocity rivers in a safe manner.

31. SEPA is exploring the potential to extend its current quality accreditation for the ISO17025:2000 standard to hydrometry. This would demand, amongst other things, that all methods are fully validated and that SEPA demonstrate staff competencies. Surveillance visits would involve method assessment and the evaluation of staff's competencies.

32. The Hi-Flows website will become the portal for all AMAX and POT time series in the UK and SEPA together with the Environment Agency and Rivers Agency are committed to maintaining this database on an annual basis.

33. Access to recent data or data not held on the Hi-Flows database will continue to be available from SEPA.

34. SEPA has recently purchased high resolution GPS equipment to capture flood event data. This equipment, together with contracted surveys will be used to maintain SEPA's database of flood events to inform the mapping of flood risk and to allow SEPA to give advice to local authorities.

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