Case study: Loch of Lintrathen

Dr Zoe Frogbrook

Technical Lead: Catchment Management

Scottish Water

Loch of Lintrathen

- Was a natural Loch – raised by 8m
- Catchment area 73km^2
- Clatto WTW treats around 61Ml of water a day and supplies 180,000 people in the Dundee area

Lintrathen from the air by Amanda Hutcheson

Scottish Water

Always serving Scotland

Key issues

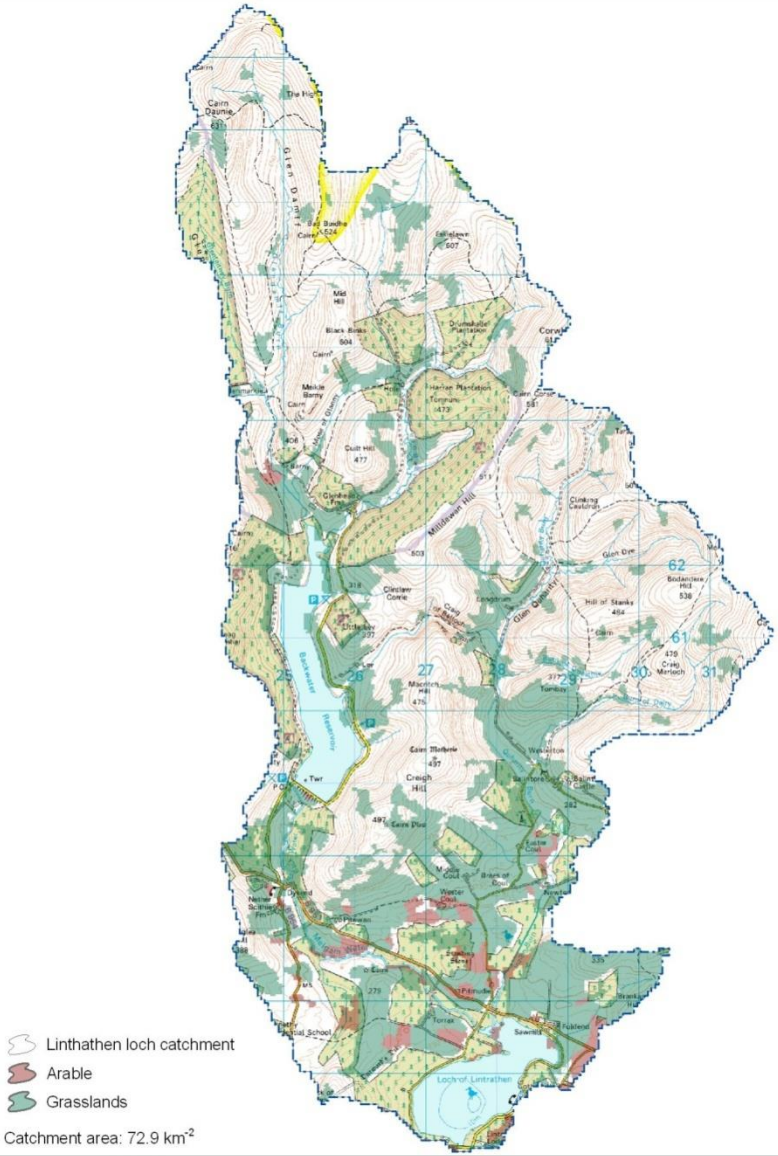
- Nutrient inputs from P and N
- Formation of Algae
- Impacts on water treatment process

Sources and Pathways

- Agriculture & Forestry – residual or excess fertiliser, soil disturbance, erosion, runoff
- Avian and fish excrement
- Septic tanks
- Build up of sediment in the Loch

Scottish Water

Always serving Scotland



1:64,338

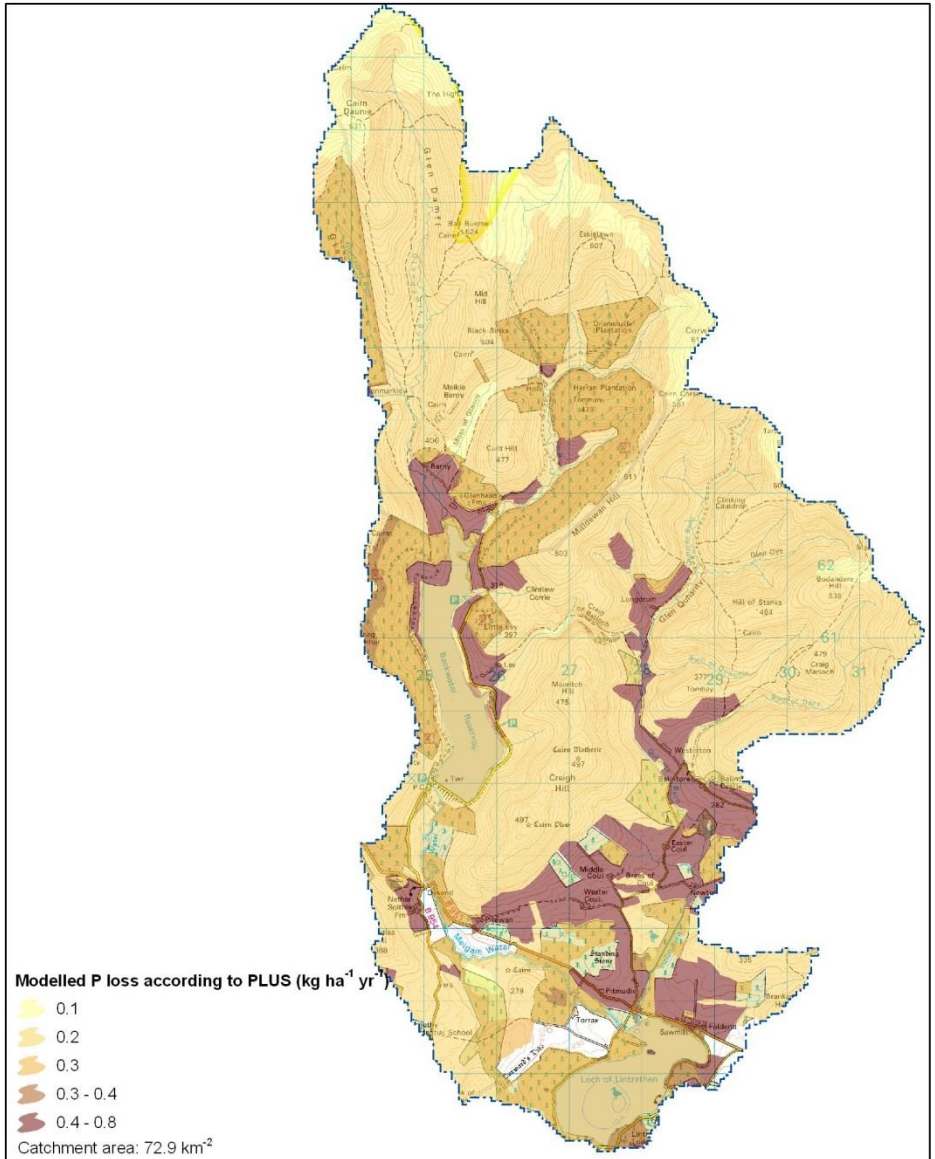
0 0.45 0.9 1.8 Kilometres

0 0.45 0.9 1.8 Miles

Helpdesk ref: N/A. Produced: 29/11/2006

Landcover in the Loch of Lintrathen catchment

SEPA Scottish Environment Protection Agency



1:64,338

0 0.45 0.9 1.8 Kilometres

0 0.45 0.9 1.8 Miles

Helpdesk ref: N/A. Produced: 29/11/2006

Modelled P loss in the Loch of Lintrathen catchment

SEPA Scottish Environment Protection Agency

Impacts

- Operational perspective – block filters and reduce rate of flow
- Algae release CO_2 – alters pH and can disrupt coagulation process
- Toxic by-products produced by algae as die and decay
- Can result in THM production
- Taste & Odour (earthy & musty) from decaying algae passing through the filters
- Consequences
  - Compliance issues at Clatto WTW and customer complaints
  - Blocked filters or additional treatment required
  - Significant impact on costs, increased energy and chemical use and waste produced

Scottish Water
Always serving Scotland

Consequences

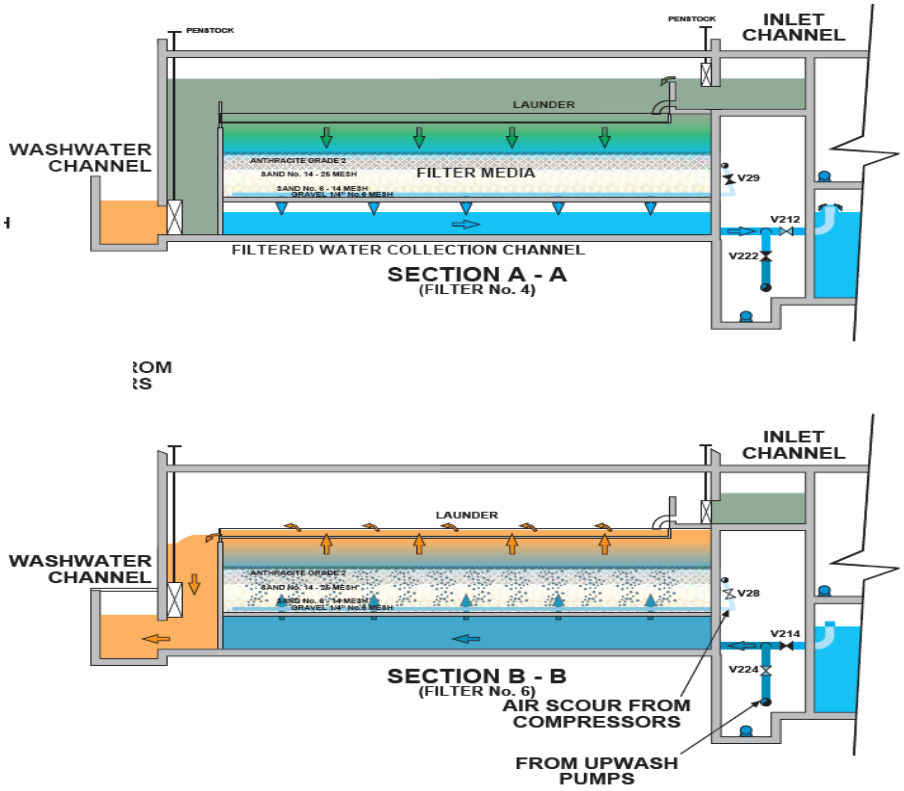
- Compliance issues and customer complaints
- Blocked filters or additional treatment required
- Significant impact on costs, increased energy and chemical use and waste produced

Water Treatment Process

‘Single Stage’ Process

- Water from reservoir enters WTW
- Coagulating chemicals added to remove particulates and pH corrected
- Water passed through filters beds of sand and anthracite for finer particulates. pH adjusted
- Chlorine added

- Filters backwashed regularly to remove ‘dirt’ particles
- ‘Washwater’ is treated to separate ‘sludge’ from water
- Water re-cycled to head of works
- Sludge disposed to Landfill



Scottish Water

Always serving Scotland

Current controls for Algae

- Keep Lintrathen as full possible during summer
- Use a ‘blend’ of water from Backwater with Lintrathen to supply Clatto WTW
- Use two air blower units to de-stratify/mix the loch
- Minimise Nutrient input into loch to reduce potential for algal blooms

Lintrathen Loch 13th January 2004

5m below top water level

- Insufficient, additional treatment may be required

Scottish Water

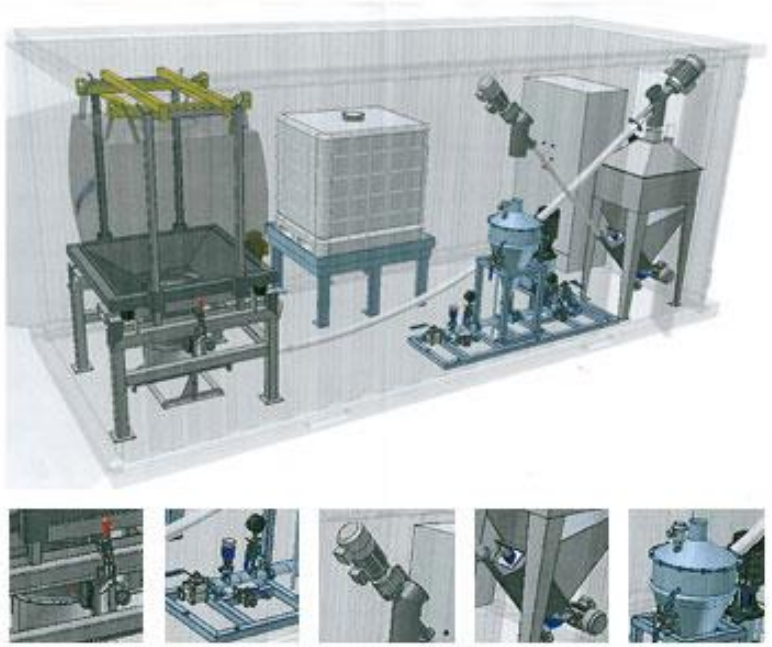
Always serving Scotland

Taste & Odour Treatment

- Taste & Odour using Powdered Activated Carbon (PAC)
- PAC is supplied as a powder added to water upstream of filters
- PAC adsorbs T & O compounds
- PAC removed by filters

- Typical requirements around 1 tonne of PAC per day, could be as high as 8

- Adds to volume of sludge, chemical and energy use



Typical Containerised PAC Dosing Plant – two would be required (image from Spiroflow)

Scottish Water

Always serving Scotland

Treatment of Toxins

- Toxins can be broken up by treating with Ozone gas which is a powerful oxidising agent
- Ozone would be generated on site by passing electricity through Oxygen gas
- Remaining compounds removed by PAC
- High Electricity use

Ozone Plant at Glenfarg WTW

Scottish Water

Always serving Scotland

Algae Water Treatment Issues - Costs

- Estimated cost of the Ozone/PAC treatment plant
- Capital Cost = approx. £3.7m
- Running cost (£200,000 - £800,000 p.a.
- PAC costs around £250/tonne

  (1 – 8 tonnes/day)
- Large carbon footprint

Ozone Generator (photo from Degremont)

Additional treatment is costly, chemical and energy intensive

SW public owned and funding body - aim to provide value for money

Scottish Water

Always serving Scotland

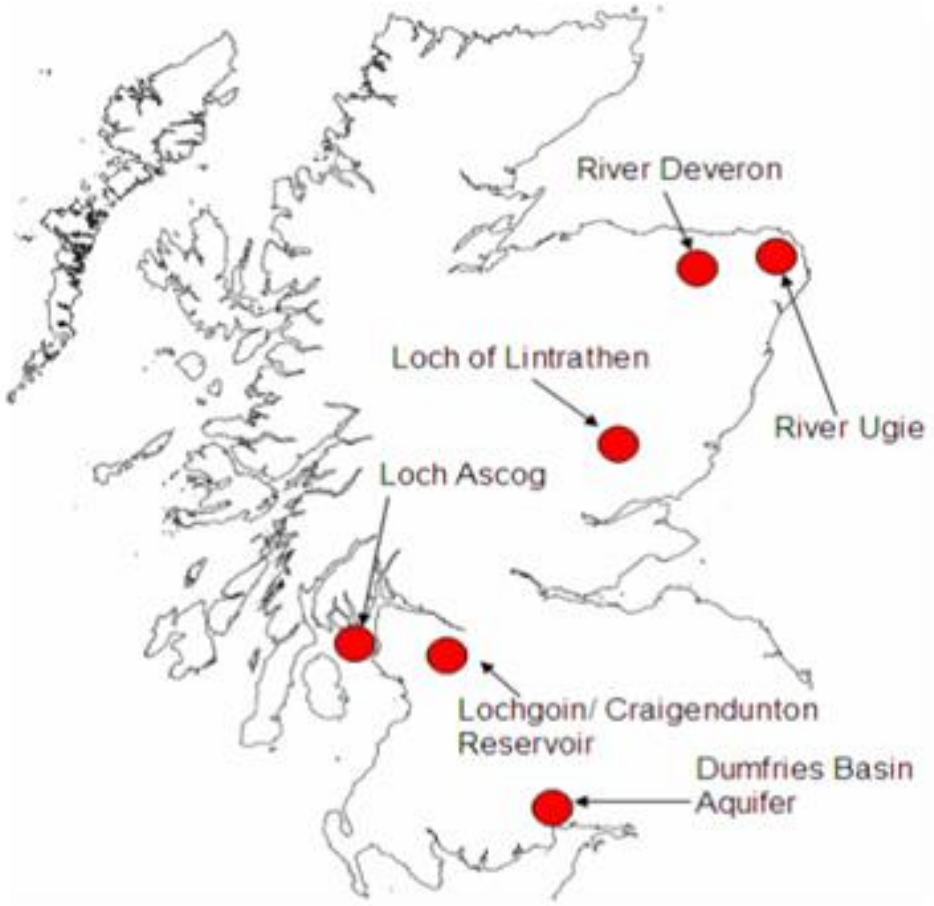
Sustainable Land Management

- Looks to protect and improve the quality of drinking water within a catchment
- To work in partnership with land managers, owners and tenants
- To promote a sustainable approach to the improvement and protection of drinking water

Sustainable Land Management Incentive Scheme

- Scheme started April 2012 & updated in April 2013
- Assists with the finance of measures that will improve and protect drinking water quality
- Cannot be used to meet regulatory compliance

Who is eligible to apply?



Area	Pressure
River Ugie	Pesticides
River Deveron	Pesticides
Loch of Lintrathen	Nutrients
Loch Ascog	Nutrients
Dumfries Basin	Nitrates
Lochgoin/ Craigendunton Reservoirs	Colour

Scottish Water

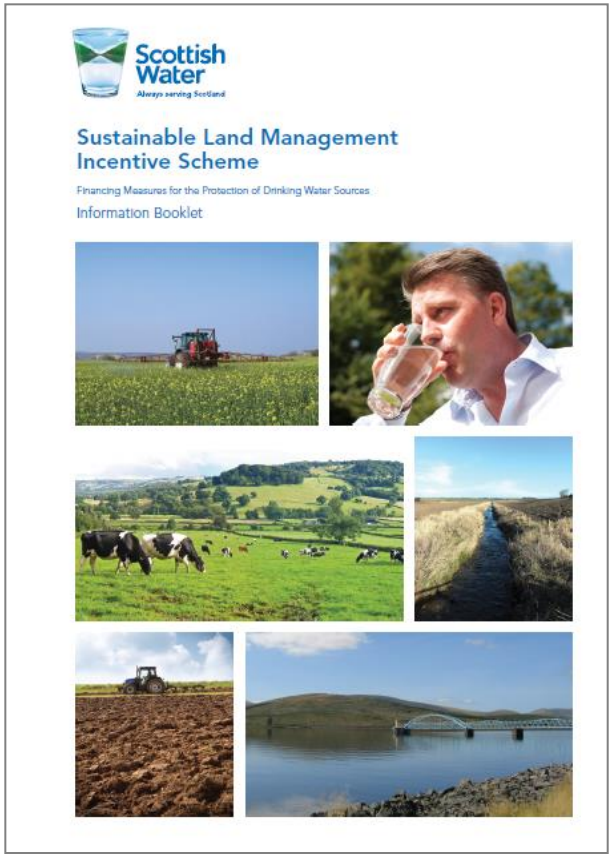
Always serving Scotland

What does the scheme provide?

- Assistance with financing for selected management and capital items
  - 100% for management items
  - 60%, 75% or 100% for capital items according to item & LFA status

- Annual finance up to a maximum of £20,000

- Full details on items and payment rates can be found in our information booklet



www.scottishwater.co.uk/protectdwsources