

Hunter River Salinity Trading Scheme

Working together to protect river quality and sustain economic development

Department of **Environment and Conservation** NSW



A world-class scheme for protecting waterways



Photo: DIPNR

A community working together to protect river quality and sustain economic development.

The NSW Government's Hunter River Salinity Trading Scheme leads the world in using economic instruments for the effective protection of waterways. The scheme has been responsible for restoring the waters of the Hunter to an unprecedented level of freshness. Water salinity¹ is more stable and lower—the river is now as fresh as many bottled mineral waters.

The scheme allows agriculture, mining and electricity generation to operate side by side, sharing the use of the river.

It wasn't always like this.

Before the scheme there was significant conflict between primary producers and mining operators. Discharges from industry increased salt levels in the river at times making the water unsuitable for irrigation. Primary producers responded by seeking tighter regulation of emissions. To address strong community concerns about new discharges, new mine proposals were facing extremely high costs.

The scheme is a huge win for the entire Hunter River community. Agriculture benefits from fresh irrigation waters while miners and electricity generators can make controlled discharges of excess waters.

It protects the region's most precious natural resource, provides for diverse interests to work together, and allows continued economic development, providing a secure future for the region.

¹ Water salinity is estimated by measuring electrical conductivity. The more salty water is, the more it conducts electricity. Electrical conductivity is measured in microsiemens per centimetre ($\mu\text{S}/\text{cm}$). Drinking quality water usually measures between 600EC and 1200EC.

Since the scheme started, river salinity has more consistently been below the salinity target.

Electrical conductivity at Singleton 1980 to 2002 (monthly means)

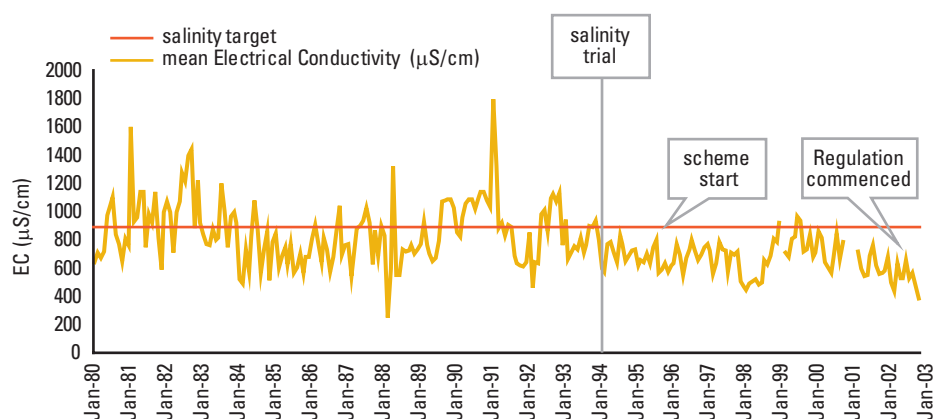




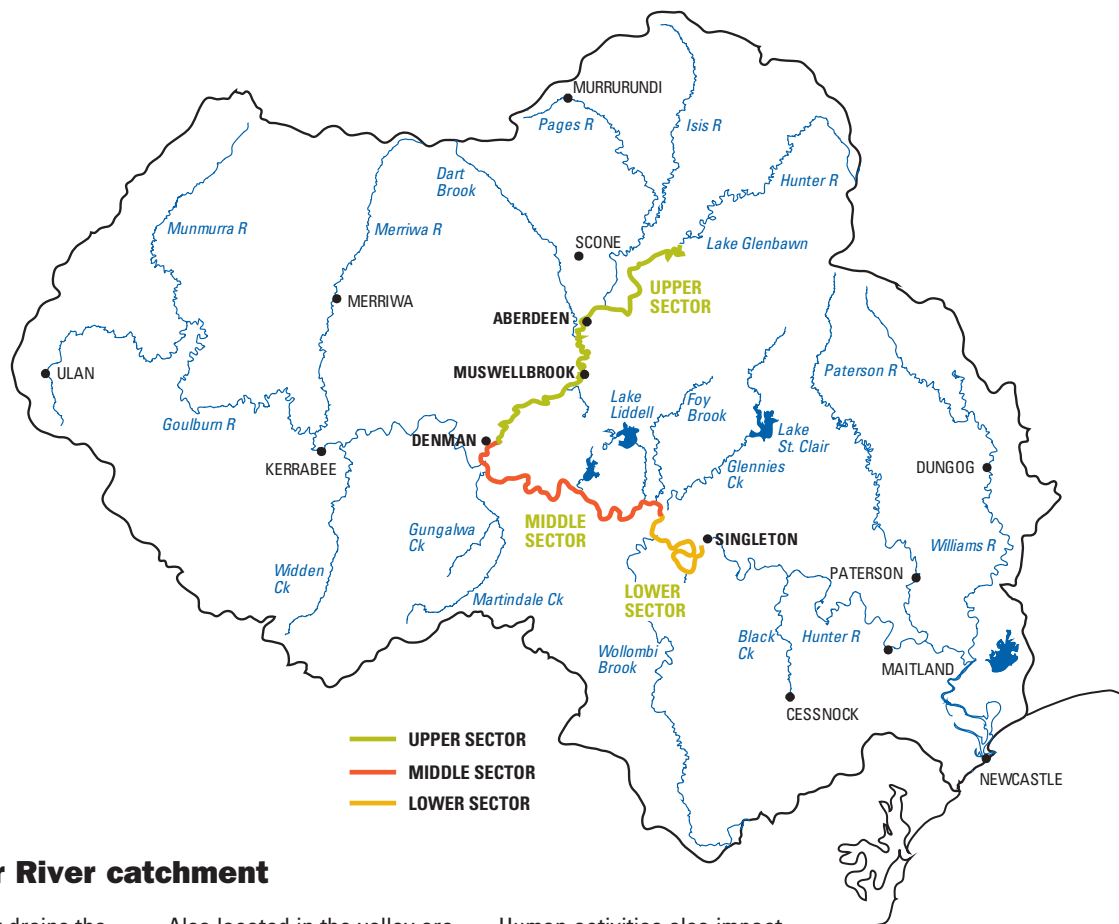
Photo: State Water



Photo: DIPNR



Photo: DIPNR



The Hunter River catchment

The Hunter River drains the largest coastal catchment in New South Wales, covering some 22,000 square kilometres.

The Hunter region supports a range of agricultural activities including wineries, dairying, vegetables, fodder, beef and horse breeding.

Also located in the valley are over 20 of the world's largest coal mines and three power stations, including Australia's largest electricity generator.

Salt occurs naturally in many of the rocks and soils of the Hunter Valley. Some of this salt is leached into groundwater and nearby rivers.

Human activities also impact on river saltiness. During coal mining, salty water collects in mine pits and shafts and has to be pumped out to allow mining operations to continue.

Electricity generation uses large volumes of river water for cooling. As this water evaporates, natural salt is concentrated in the water that remains.

How the scheme works

The central idea of the scheme is to only discharge salty water when there is lots of low salt, fresh water in the river.

This is when the river can best handle salt discharges because:

- large amounts of fresh water dilute the saltier discharge so the impact on the river is not as great, and
- through careful control, the mixture of river and discharge water can be kept fresh to meet water quality standards.

Going with the flow

Monitoring points along the river are used to measure whether the river is in low flow, high flow or flood flow.

When the river is in **low flow**, no discharges are allowed.

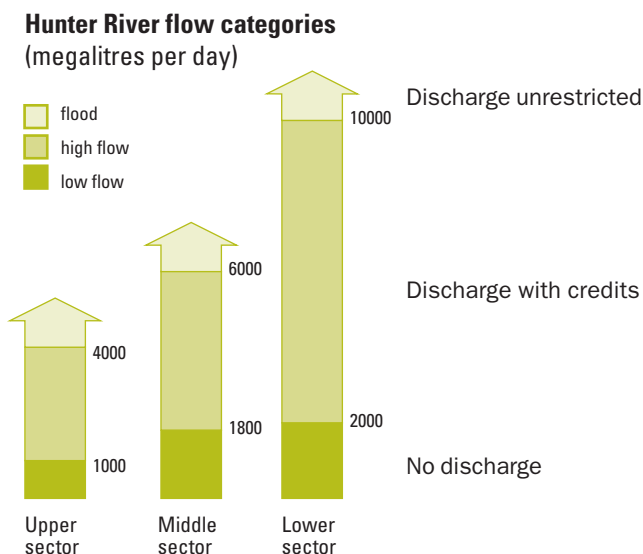
When the river is in **high flow**, limited discharge is allowed—controlled by a system of salt credits. The amount of discharge allowed depends on the ambient salinity in the river, so it can change daily. The total allowable discharge is calculated so that the salt concentration does not go above 900EC in the middle and lower sectors of the river, or above 600EC in the upper sector.

When the river is in **flood**, unlimited discharges are allowed as long as the salt concentration does not go above 900EC. Members of the scheme coordinate their discharges so that this goal is achieved.

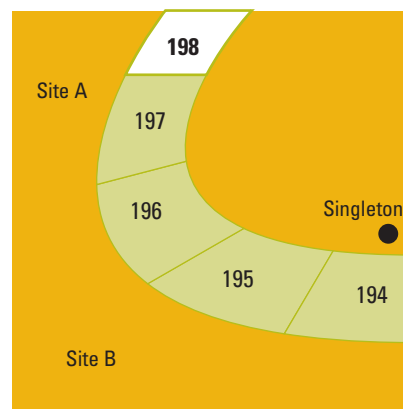
The river is divided into 'blocks'

The water in the river is nominally divided into numbered blocks. A block is a section of water that flows past Singleton in a day. So, block 2003-198 is the block of water that will flow past Singleton on the 198th day of 2003 (17 July). This block of water will flow past other points on the river on different days.

For each block, the scheme operators continually monitor the flow level and the ambient salinity and then calculate how much salt (if any) can be added to the block (Total Allowable Discharge) so that salinity stays under the target.



Example of discharge controlled by credits



The river is divided into numbered blocks. For example, block '2003-198' will pass Singleton on the 198th day of 2003 (17 July). In this example, suppose block 198 could hold 112 tonnes of salt.

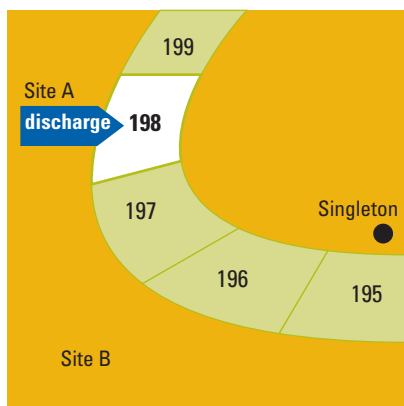
Credits determine who can discharge salt

There are a total of 1000 salt discharge credits in the scheme—different licence holders have different numbers of credits (see page 10 for a list of credit holders and the initial credit allocation). Licence holders can only discharge salt into a river block in proportion to the credits they hold—1 credit allows a discharge of 0.1% of the total allowed.

So, suppose block 2003-198 could handle 112 tonnes of salt (the Total Allowable Discharge for this block). Then, a licence holder with 20 credits could discharge 2.24 tonnes ($112 \times 20 \times 0.1\%$), and a licence holder with 45 credits could discharge 5.04 tonnes ($112 \times 45 \times 0.1\%$), into that block.

The licence holder performs a second calculation to determine what volume of their discharge water contains the permitted tonnage of salt.

Note: the River Register indicates when discharges can occur (see page 8).



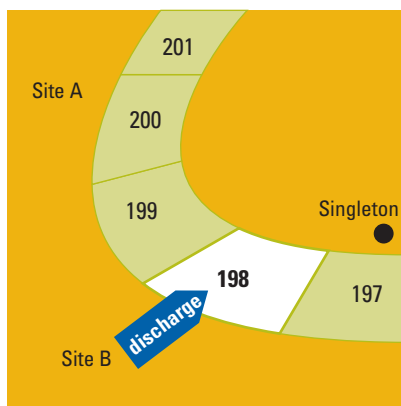
On 15 July, block 198 passes **Site A**. With 20 credits, Site A could discharge **2.24 tonnes** ($112 \times 20 \times 0.1\%$).

Credits can be traded

Licence holders' need to discharge depends on highly variable operational conditions at each site. Credit trading gives each licence holder the flexibility to increase or decrease their allowable discharge from time to time while limiting the combined amount of salt discharged across the valley.

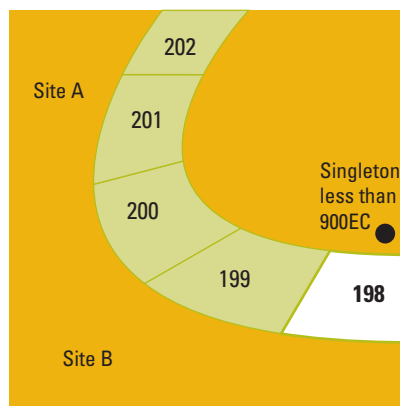
The trading system is online, allowing licence holders to trade quickly and simply. The trades can be for one or many blocks (i.e. a single day or longer periods), and the terms of the trade are negotiated by the parties involved.

A register ensures the information on credit holdings is publicly available at all times. Other information on the trading scheme is also available.



On 16 July, block 198 passes **Site B**. With 45 credits, Site B could discharge **5.04 tonnes** ($112 \times 45 \times 0.1\%$).

If Site A did not discharge, it could trade 20 credits to Site B which could then discharge 65 credits of salt—7.28 tonnes ($112 \times 65 \times 0.1\%$).



On 17 July, block 198 passes Singleton with salt concentration less than 900EC.

What makes this scheme successful?

The scheme has been designed to suit the unique characteristics of the Hunter River catchment.

A number of key factors working together have made this innovative solution such a success.

Rigorous data and modelling

Having a good understanding of the river was the basis to designing an effective scheme. Data has been collected over many years and a model of the river's behaviour developed by the former Department of Land and Water Conservation (DLWC).

The researchers found that when the flow in the river increased, salinity increased for a few hours and then dropped to very low levels. Their explanation was that it rose initially as the river picked up salt from riverbanks and pools, but then fell as freshwater run-off diluted the salt concentration. These very low salinity levels were identified as the best time for discharges—the river could handle extra salt and still remain fresh.

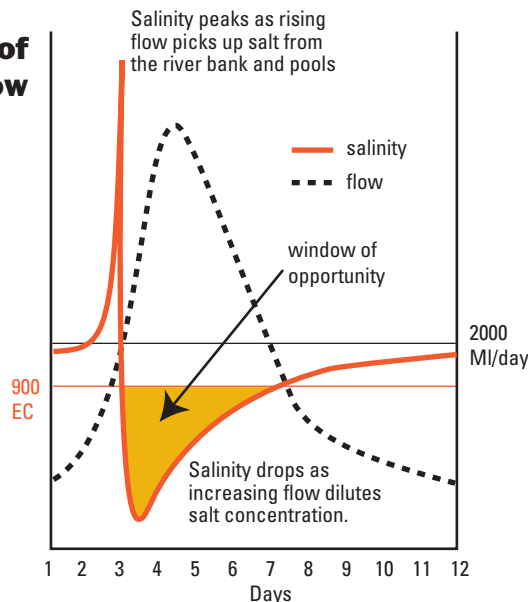
A community prepared to work together and try new ideas

The scheme only came into being because the parties involved were prepared to work together to find a solution. Mines, power stations and farmers put years of conflict and mistrust behind them to find a way forward. The Environment Protection Authority (EPA) played an important role in looking for alternative market-based strategies rather than reapplying traditional pollution control thinking. DLWC was instrumental in trialling and implementing the water management aspects of the scheme. The NSW Minerals Council also played a central role.

The scheme is a result of extensive consultation with the community and was thoroughly trialled before being formally established by the Minister for the Environment, the Hon. Bob Debus under the Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002. A pilot scheme operated from 1995 to 2002, allowing the approach to be refined based on experience.

The Hunter Catchment Management Trust, as Chair of the scheme's Operations Committee, brings stakeholders together regularly to review scheme performance. It includes water users, mining, electricity generation, government and community representatives (see list on page 11).

Relationship of salinity to river flow



A focus on environmental outcomes, and a break with tradition

Traditional approaches focus on individual sites and require discharge minimisation at each. Under this approach, ‘trickle’ discharges were allowed all the time without an effective link back to the state of the river.

In dry times the river became very salty, and unusable for irrigation when it was needed most. In wet weather the opportunity to discharge without a negative impact was often missed. The end result was high and variable salinity, with no guarantees that particular levels of freshness could be maintained.

Under the new scheme, focusing on the environmental goal—keeping salinity under 900EC—gives licence holders flexibility when developing their saline water management strategies. They can choose to combine pollution abatement technologies with salt credits in the most cost effective manner for their organisation. Each licence holder may choose a different strategy, but the combined discharge will not compromise the freshness of the river.

Underpinned by legislation

Participants in the scheme are licensed by the EPA. The Environment Protection Licence defines the discharge points and the monitoring and reporting requirements. Any licence holder discharging outside the limits of the scheme is violating their licence conditions, and penalties apply.

The Regulation contains the Scheme rules and additional safety measures, such as discounting the value of credits if too many are traded into the one river sector.

For more information, refer to the:

- *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002* and
- *Protection of the Environment Operations Act 1997*.

These can be viewed on the Department of Environment and Conservation (DEC) website at www.environment.nsw.gov.au or obtained from the NSW Government Information Service.

Real time data and trading

A Services Coordinator manages the information that underpins the scheme. Twenty-one monitoring gauges collect information along the length of the river. Every 10 minutes measures of river flow and salinity are collated then sent by radio or phone to the central data warehouse.

River modelling experts use this information to calculate the Total Allowable Discharge in response to changing river flow and rainfall within the catchment area.

A daily River Register is maintained on a dedicated website. It notifies each credit holder about the amount of salt that can be discharged, and the start and end times for each release.

Participants need to hold sufficient credits to meet their discharge needs. Credit trading is done via the online credit exchange facility.

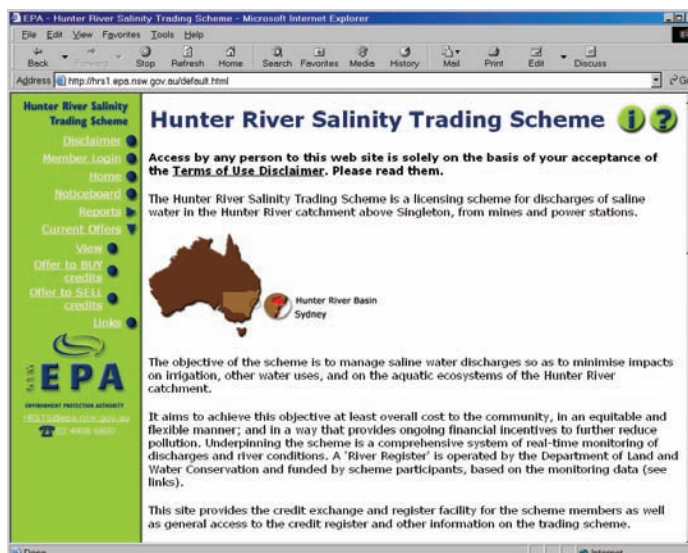
Sample pages of the River Register and the Credit Trading websites are shown on the next page.

Sample pages from the Scheme's websites

The River Register is available to the public at www.hits.nsw.gov.au.

River Register			
Block Number 2003-56(4) Fixed	Total Allowable Discharge: 847 Tonnes (not applicable if in flood)		DATE WHEN BLOCK PASSES SINGLETON 25/02/2003
Credit Holder	Site Discharge Period		Sector
	Discharge Start	Discharge Stop	
Dartbrook	24-02-2003 05:00	25-02-2003 05:00	UPPER
Muswellbrook No. 2	23-02-2003 11:00	24-02-2003 11:00	Block Classification: High
Bengalla	24-02-2003 07:00	25-02-2003 07:00	Sector Credit Discount Factor : 1
Hunter Valley Operations West	24-02-2003 03:00	25-02-2003 03:00	MIDDLE
Hunter Valley Operations North	24-02-2003 18:00	25-02-2003 18:00	Block Classification: High
Liddell Coal	24-02-2003 08:00	25-02-2003 08:00	Sector Credit Discount Factor : 1
Bayswater Power Station	24-02-2003 03:00	25-02-2003 03:00	
Mount Owen	24-02-2003 13:00	25-02-2003 13:00	
Ravensworth/Narama	24-02-2003 18:00	25-02-2003 18:00	
Lemington	25-02-2003 00:00	26-02-2003 00:00	LOWER
Wambo	24-02-2003 16:00	25-02-2003 16:00	Block Classification: High
Redbank	24-02-2003 18:00	25-02-2003 18:00	Sector Credit Discount Factor : 1
Bulga/Saxonvale	24-02-2003 09:00	25-02-2003 09:00	
Warkworth	24-02-2003 18:00	25-02-2003 18:00	
Mt. Thorley Operations	24-02-2003 18:00	25-02-2003 18:00	
DATE AND TIME OF ISSUE: 25/02/2003 08:51:58 EASTERN STANDARD TIME Start and stop times are from discharge points.			

Credit trading is done online, (www.environment.nsw.gov.au/hrsts/) and can be completed within a few minutes.



Allocating credits

Initial credit allocation

Credits were first allocated free of charge to licence holders, based on a formula that took into account the environmental performance, salty water by-product, employment and economic output of each licence holder.

Credits were reissued when the Regulation was introduced.

The initial credits have different life spans:

- 200 expire on 30 June 2004
- 200 expire on 30 June 2006
- 200 expire on 30 June 2008
- 200 expire on 30 June 2010
- 200 expire on 30 June 2012.

200 new credits auctioned every 2 years

Every two years 200 new credits will be created to replace those that have expired. These new credits have a lifespan of 10 years. For example, the first 200 credits auctioned will span block 2004/183 (1 July 2004) to block 2014/181 (30 June 2014).

This arrangement means that 200 new credits will be available every two years into the future, but the total number of active credits is limited to 1000.

The new credits will be sold by public auction, a process that can reveal the market value of credits. New industry can enter the scheme by buying credits at auction, or by acquiring credits directly from other scheme participants.

Environmental protection at least economic cost

Licence holders can choose the most cost-effective strategy for their operation. This can be a mix of:

- buying more credits, and
- implementing cleaner technologies or practices (such as re-use or minimising the generation of saline water) so that fewer credits are needed.

The long life span of credits allows industry to plan ahead and adjust their processes over time. The result is that environmental outcomes are achieved at least cost to the community.

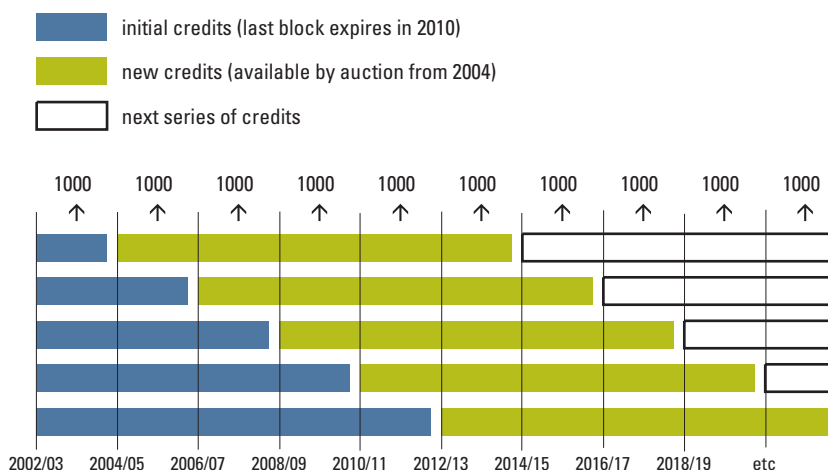
Lifespan of credits

Each block represents 200 credits.

Every year the total number of active credits is limited to 1000 credits.

Every 2 years, 200 credits expire and 200 new credits are created and sold by public auction.

New credits have a lifespan of 10 years, so the first 200 credits will be active from 1 July 2004 to 30 June 2014.



Reference information

Scheme participants

Licence holders and credit allocations at commencement of the Regulation

Credit holder	Licence number (if applicable)	Premises name (if applicable)	No. of credits
Bengalla Mining Company Pty Ltd	6538	Bengalla Mine	35
Bulga Coal Management Pty Ltd	563	Saxonvale Colliery Holding	40
Camberwell Coal Pty Ltd	3390	Camberwell Coal Mine Colliery Holding	15
Coal and Allied Industries Ltd	640	Hunter Valley Operations	120
Coal and Allied Industries Ltd	1976	Mt Thorley Colliery Holding	0
Cumnock No 1 Colliery Pty Ltd	37	Cumnock No 1 Colliery	15
Dartbrook Coal Pty Ltd	4885	Dartbrook Coal Mine	15
Drayton Coal Pty Ltd	1323	Drayton Coal Mine Colliery Holding	25
Hunter Valley Coal Corporation Pty Ltd	4460	Mt Owen Coal Mine	15
Lemington Coal Mines Ltd	1497	Lemington Coal Mine Colliery Holding	40
Liddell Coal Operations Pty Ltd	2094	Liddell Colliery Holding	55
Macquarie Generation	779	Bayswater Power Station	230
Mt Arthur Coal Company Ltd	113	Bayswater Colliery	25
Muswellbrook Coal Company Ltd	656	Muswellbrook No 2 Open Cut Coal Mine	10
Nardell Coal Corporation Pty Ltd	10337	Nardell Coal Corporation Pty Ltd	30
Ravensworth Operations Pty Ltd	10860	Ravensworth East Mine	0
Ravensworth Operations Pty Ltd	2652	Ravensworth Operations Narama Mine	100
Redbank Project Pty Ltd	11262	Redbank Power Station	35
Rix's Creek Pty Ltd	3391	Rix's Creek Colliery	25
United Collieries Pty Ltd	3141	United Colliery	10
Wambo Mining Corporation Pty Ltd	529	Wambo Mining Corporation	35
Warkworth Mining Ltd	1376	Warkworth Colliery Holding	40
New South Wales Environment Protection Authority	NA	NA	85
Total credits			1,000

- Initial credit holders are shown in the table, however, credit holders may vary from time to time. Details of current holders can be found on the DEC website (www.environment.nsw.gov.au/hrsts/).
- Although some of the participants referred to above were not initially issued with credits, they will be able to participate in trading.
- Some credits were initially kept by the EPA as a transitional mechanism. All residual credits were allocated during 2003, so all 1000 credits are held by participants.

Administrative roles

River monitoring, modelling and the river register are provided by the Services Coordinator at the Department of Infrastructure, Planning and Natural Resources (formerly Department of Land and Water Conservation).

Administration of licensing and regulation, online credit register and exchange facility are provided by DEC.

The Operations Committee considers issues in relation to the day-to-day operation of the scheme.

Scheme management

The Hunter River Salinity Trading Scheme Operations Committee consists of:

- a member nominated by the Hunter River Catchment Management Trust
- four members to represent the interests of licence holders
- a member to represent the interests of irrigators
- a member to represent environmental interests
- a member from an organisation concerned in the management of a river in the catchment
- a member from the Department of Infrastructure, Planning and Natural Resources.

The cost of administering the scheme is shared equally between credit holders and discharge licence holders. (In the future credits may be held by persons other than licensees).

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