

## **An overview of the Shoalhaven REclaimed water Management Scheme (REMS), protecting River Bay and Ocean**

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### **Key Points**

- Shoalhaven Water Re- claimed water scheme (REMS) improves water quality for the Shoalhaven River, Jervis Bay and Ocean, by creating high quality non potable re-claimed water for agricultural use and other applications.
- Three decades of public consultation, clear communication, planning and construction delivers a comprehensive sewage effluent treatment and re-claimed water distribution network and reduced outfall.
- This is a scalable effluent capture, process and re-claimed water distribution system applicable to larger cities and smaller township
- Initiated by public outcry over effluent discharge into Jervis Bay, resulting in an outcome focused on the productive re-use of non-potable re-claimed water, benefitting the Dairy and Oyster industries and the marine environment.

### **Abstract**

Shoalhaven REMS was initiated to address the problem of sewage outfall into Jervis Bay, a marine park; the Shoalhaven River, host to a signature oyster industry; and, the ocean.

There were three main drivers for the scheme: Public outcry over sewage outfall; Development constraints until a solution found; and, Utilising reclaimed water for agriculture.

The project involved a significant “buy in” from the rate payers, on the issue of reclaimed water, via a thorough awareness campaign. Federal, State and Local governments were aligned, committed to a deliverable outcome. Two industries have historically occupied the Shoalhaven delta, the oyster industry around Greenwell Point; and the dairy industry. Oysters are a “canary in the mine” for water quality. The Dairy Industry offered an agricultural opportunity for the utilisation of Reclaimed Water, for “drought proofing”.

The Shoalhaven is complex: towns, industry, agriculture, wilderness, river, coast, and tourism. The population in the vicinity of REMS, is approximately 60,000 people, tripling in summer. This is a real-world model that is scalable, based on simple technology and public and industry consultation. The project delivers a network of linked waste water infrastructure, and reclaimed water distribution, and, a clear environmental outcome for River, Bay and Ocean.

### **Keywords**

River, Bay, Ocean, Outfall, Effluent, Reclaimed-water, Dairy, Oyster

### **Introduction**

On Wednesday the 21<sup>st</sup> of April 2021, at the newly commissioned Nowra Sewage treatment plant, the Shoalhaven Council **RE**claimed Water Management Scheme, known as REMS, Stage 1 B was officially declared open by the Mayor, C/r Amanda Findley. Stages 1A and 1B has been a complex but highly co-operative 3 decade journey involving all levels of government, agriculture, aquaculture, townspeople, public officers and private operators, working together to create a \$150m infrastructure investment, that will help protect the Shoalhaven River, Jervis Bay and Ocean.

Thirty years ago, concerned members of the public were outraged by sewage effluent being discharged into Jervis Bay, a (now) NSW Marine Park and popular tourism destination on the NSW south coast, approximately 200km south of Sydney and a similar distance east of Canberra.

It was this public outrage that was the catalyst for the creation of the one largest local Government water re-cycling initiatives in Australia.



Figure 1. The Northern Shoalhaven region Nowra to Jervis Bay

Jervis Bay is within the local Government Area of Shoalhaven City Council, based in the township of Nowra, which sits on the edge of the Shoalhaven River, 20kms upstream from Crookhaven Heads. Jervis Bay is approximately 30kms south east of Nowra.

The population of the area of the LGA around Jervis Bay and Nowra, the Northern Shoalhaven Region, is in the vicinity of 60,000 people, this population increases significantly over the summer period, with the influx of domestic and international tourists. Nowra is surrounded by agriculture, has a significant industrial and commercial area, a Navy airfield and training facilities, schools, tertiary facilities and a hospital and associated amenities. Downstream of Nowra, in the river delta, is an expansive oyster industry located in and around Greenwell Point. Oysters and Dairy have been the signature produce of the region for over a century.

The region has Indigenous and European heritage values. Featuring both Jervis Bay and the Shoalhaven River.

Shoalhaven Water, under direct control of Shoalhaven Council, is the water utility responsible for the provision of potable water and the processing and “disposal” of waste water for the whole of the Local Government Area (LGA). At Nowra, the Shoalhaven River is saline and tidal. Water for potable production is drawn approx. 20kms further upstream and captured in an off stream dam, prior to treatment and distribution. Further

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upstream in the escarpment Tallowa Dam, a Water NSW asset, is the primary water source for the Shoalhaven and is part of the Sydney water supply network. The dam is operated in accordance with a Water Sharing Plan.

### **A brief description of the geography..**

The Shoalhaven LGA runs from the township of Berry, in the north, 150 kms south to North Durras; it is bounded by the Pacific Ocean to the east and generally less than 50kms to the Great Dividing Range in the west. The area is effectively broken into two regions separated at Jervis Bay; Nowra is the largest town in the northern Region and Ulladulla is the largest town in the southern Region. A variety of townships from coast to escarpment, over 100 beaches and spectacular sandstone cliff coastline punctuated by lakes, bays and river systems, including the Shoalhaven that gives the region its name. A temperate climate with generally good rainfall and soil quality has enabled a diversity of agriculture, including dairy and wine, along with marine conditions that have supported commercial and recreational fishing and oyster and mussel aquaculture.

This geography and climate has created the basis upon which a developing tourism economy is growing, with the tagline “unspoilt” being a feature of its appeal. This popularity has also led to an increase in the permanent population, which in turn has placed pressure on infrastructure. One of the most evident requirements was the development of an effective, environmentally responsible, sewage capture, treatment and “disposal” system.



**Figure 2. Jervis Bay at Callala Beach looking to Point Perpendicular and Bowen Island**

So, not only was there a public outcry over outfall into Jervis Bay, there were development pressures that needed solutions, the evidence for which was building in the 1980's.....

While the original solution to the problem had been the idea of a supplementary Ocean out-fall at Governor Head, the southern head of Jervis Bay, the public and government appetite for further outfalls had turned, so two other alternatives were examined: the creation of a series of re-claimed water based wetlands, or, the beneficial re-use of re-claimed water for agriculture.

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It was this latter option that developed into REMS, servicing the bulk of the northern Shoalhaven Region; however a number of complex issues needed to be addressed that at first may all have appeared impossible: A plan acceptable to the public, government, and the emerging environmental lobby, needed to be hatched. Budgets needed to be established and funding models developed.

All levels of government had a stake in the outcome and needed to be on-board

An agricultural end use had to be identified for the re-claimed water

Significant levels of consultation were about to begin,, to create trust via transparency.

In reflection, this is an “at scale’ version of the challenge to many, many urban centres, across the country, and indeed, across the globe.

### **Before REMS**

At this time a number of unconnected sewage treatment plants across the norther Shoalhaven region discharged treated sewage into Jervis Bay, The Shoalhaven River and the Ocean.

The direct “stakeholders” for water quality improvements in each of these environments are:

The marine park status and attributes of the Jervis Bay marine environment.

The Shoalhaven River generally with the Oyster industry as the canary in the mine.

The quality of the Ocean environment, beaches, fishing, coastal communities..

### **Advocacy and communication, leadership and respect**

The combination of a committed council and its water utility, both enjoying strong co-operative leadership, coupled with a supportive and pro-active State government including a highly engaged minister of both agriculture and environment; and, Federal support at ministerial level for a deliverable outcome, provided the context to move forward.

Exhaustive public consultation and public engagement in the concept of increased quality of treatment, reduced discharge to outfall, and, beneficial re-use of re-claimed water for agricultural (non-potable) purposes, created an atmosphere of trust that manifested itself as a public vote to increase rates to help pay for the system.

The end use agriculture was originally considered as forestry, however the dairy industry emerged as a better potential prospect, but this was going to require cultural change.

### **Dairy in the Shoalhaven**

Although much of the dairy industry across Australia uses irrigated pasture, the Shoalhaven region had no tradition of doing so, as it was generally considered that rainfall was adequate and that drought could be “accommodated”.

Located in the area east of Nowra through to Greenwell Point, the dairying occupies the flat river flood plain, and has done so for over a century. The river in this vicinity is saline and unsuitable for irrigation; each of the farms is connected to “Town Water”, so any supplementary on farm water prior to REMS had to come from the town potable water supply.

The herd is pasture fed supplemented with maize grown on site. Apart from irrigation, water is required for dairy wash down and cattle drinking water.

Dairy farming is a 24/7, 365 day a year activity that is highly mechanised and managed, it comes under strict health requirements for both the milk output and herd health.

Through the eighties and nineties the dairy industry underwent fundamental changes in its distribution and marketing structure., and the future looked unsure. What was certain is that things had changed -forever.

Some farmers could see the opportunity that REMS presented , guaranteed water supply, therefore guaranteed pasture through irrigation – if the health risks were very low and the price was right.

Once convinced on the safeguards to health in the use of re- claimed water, and having negotiated an initial supply price of \$0/kilo-litre for the first 15years of operation, a pioneering group of farmers 14 farms in all, signed up for the system. Each farmer received re-claimed water, piped to a one day holding dam; the farmers , who had formed a collective buying/ grant applying group financed the on-farm irrigation and distribution system.

This commitment gave REMS the green light.



**Figure 3. Dairy farm irrigation infrastructure with Shoalhaven River and Mt Coolangatta in the background**

### **REMS objectives**

Create infrastructure to efficiently capture, appropriately treat then distribute the highest possible volume of reclaimed water for agricultural or civic purposes. Surplus treated water will be discharged to ocean. Bi-products of the treatment system will be re-used where possible, such as biosolids, which will be prepared for use as soil conditioner on agricultural land

### **Making REMS Water – for agricultural and sports field irrigation**

The REMS project was broken into two deliverable stages: Stage 1A & Stage 1B

Stage 1A was creating the capture processing, holding and distribution network; this consisted of the upgrade and creation of 4 smaller wastewater treatment plants: St Georges Basin, Vincentia, Callala, and Culburra, linking these together via pipelines to the Coonemia storage, pumping and distribution facility. Creating the reclaimed water distribution network (of lilac pipes) to farms including on farm one-day holding dams, and sports-field applications. Ocean outfall is at the existing Penguin Head location. REMS Stage 1A was commissioned in 2001; four years after commissioning, the plants were further upgraded by the inclusion of UV treatment, in response to upgraded environmental targets.

Stage 1B was the complete upgrading of the Nowra Waste water Treatment Plant, linking this via a below river pipe to the fully upgraded Bombaderry Waste water Treatment Plant (this plant services the northern side of the river of Nowra environs); and linking both plants to the Stage 1A network. REMS Stage 1B was commissioned in March 2020 and officially opened in April 2021.

### **The River**

The Shoalhaven river rises east of Cooma and flows north around 200kms to eventually enter the Ocean at Crookhaven Heads near Culburra via Berry's canal. However, the river is actually around 50kms long below

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Tallowa Dam, flowing through forest and agriculture via Nowra on its final dash for the coast, Nowra being located at the transition point from river to river delta. The original exit point for the river was Shoalhaven Heads, often prone to silting up. In 1822 Alexander Berry, a significant landowner, created a convict dug canal linking the Shoalhaven River to the much shorter Crookhaven River at Greenwell Point, enabling it to discharge to the ocean via the more reliable Crookhaven Heads. By the late nineteenth century the oyster industry had commenced around Greenwell Point, at that point the 4<sup>th</sup> largest port in NSW.



**Figure 4. Oyster Leases at Greenwell Point**

The oyster industry grew occupying the bays and inlets around the river mouth, gradually increasing its level of sophistication and management and creating a growers and distributors association. This oyster district is responsible for a significant proportion of the State's Sydney Rock and Pacific Oyster production.

Oyster farming and sales is highly regulated and subject to rigorous reporting, testing and shutdowns in the event of poor water quality. This industry has a vested interest in the water quality of the Shoalhaven River system.

As the majority of the river below Tallowa Dam is tidal, and the proportional effect of agricultural run-off is relatively low, the discharge of waste water effluent into this system has significant potential for impact on the water quality of the river.

The river is prone to flooding.

The greatest benefit to the River environment has been the completion of REMS Stage 1B, the benefit being three fold : firstly all wastewater was being treated to a very high standard; secondly that the holding capacity of the plant had been greatly increased thereby greatly reducing the possibility of overflow during flood; thirdly the great majority of re-claimed water is diverted away from the river to either agriculture/ field irrigation or upgraded Ocean outfall.

I note that the holding capacity of the plant was sorely tested during the severe flooding of March 2020, when the Nowra plant managed to contain over 4 times its normal operating capacity, preventing any overflow into the River.

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### **The Bay**

Jervis Bay is now a NSW State Marine Park, and famously home to some of the whitest sand in the world. It is split into two main sections by Curambene Creek at Huskisson; to the north Callala Beach, Callalla Bay, around to Point Perpendicular on the Beecroft Peninsula; and south from Huskisson to Vincentia, Hyams Beach, Governor Head and Bowen Island. The Naval training facility HMAS Cresswell and the Indigenous community of Wreck Bay is located on this side.

Jervis Bay is administered in parts by State, Federal and Indigenous, and National Park management. Strangely it accommodates a naval firing range and had been the site of a proposed Nuclear Power Station.

Jervis Bay is a popular recreation destination for water sports and fishing, with some restrictions on both activities, it is also a very popular dolphin and whale watching destination.

Its popularity is derived from the quality of the aquatic environment.

With very little “run-off” and input from creek systems, the major pollution potential was due to sewage effluent disposal.

REMS stage 1A effectively eliminated wastewater from Jervis Bay.

### **The Ocean**

All water going to Ocean outfall is tertiary treated re-claimed water that has exceeded the capacity for the system to use beneficially for agricultural or civic purposes.

The quality of REMS water being discharged at Penguin Head is of significantly higher quality.

As we are talking about highly treated, usable water, this discharge to ocean outfall is wasting good resources (and degrading another), the challenge is to reduce outfall to zero.

### **Surf and turf and other options – the challenge for the future**

As it happened, REMS Stage 1 A was implemented just in time to save the dairy industry from the extremes of the Millenium drought, early to mid 2000’s, and then again during the most recent drought period finishing in 2020. REMS water was used for irrigation of pasture and maize, stock drinking, area washdown and stock spray cooling while awaiting milking, all during severe potable water restrictions. The perpetual spring of re-claimed wastewater doesn’t stop.

During periods of higher rainfall, the dairy farms utilisation drops significantly, and, therefore more REMS water is discharged to the Ocean

This a great relationship between township and agriculture, however the scope needs to be broadened to capitalise on the “product”, or variations thereof.



**Figure 5. Nowra bridge lit up to celebrate the Shoalhaven River Festival**

Intensify use within the existing REMS region...

Expand the REMS region with piped infrastructure, “piggy- backing “ on other service infrastructure...

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“Export” outside the fixed infrastructure framework by truck or rail..

Further agricultural uses that are high water users such as hydroponics, almonds, rice , cotton, stock feed production, turf, market gardens, forestry etc, some of which could occupy territory within the existing distribution network and dairy farm “footprint” including access.

Bushfire and other firefighting dams and storage provisions, including purpose made aerial pick-up dams that may also have recreational purpose (rowing, dragon boating etc.)

Industrial uses that don’t require fully potable water, manufacturing, washdown, cooling etc

A base for further treatment to become “recreational water”- water-parks , swimming pools..

Urban greening and extended civic purposes.

Dual pipe domestic uses for irrigation and washdown.

Civil works dust abatement, settlement watering and vehicle washdown...

Wetland creation and environmental water features...

Energy use including pumped hydro and hydrogen production...

### **In summary**

There are many potential uses for a product that is highly treated but at one level still presents a problem, so we have to throw it away. So why “chuck it” when a use can be found for it, as every litre used is one less litre that goes to the ocean... waste not – want not.

More dairy farmers in the region are now eager to sign up for REMS, following the success of the pioneers, this will add to consumption.

The immediate solution will be assisted with REMS Stage 2, the centre piece of which is the creation of additional holding capacity in re-claimed water storage at Coonemia, an increase of 150% over existing capacity, this will give “elasticity” to the re-claimed water supply. Funding is currently being sought for REMS Stage 2.

REMS has itself resulted in significant improvements to River, Bay and Ocean, but its most valuable contribution is in providing scalable “off the shelf technology” real-world prototype for many cities in Australia, and around the world; achieved through trust, advocacy, transparency, co-operation and perseverance, and, a willingness to give it a go.

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(Zandstra)  
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