Moutoa Sluice Gates & Floodway

Helping keep our Region safe

Introduction

The Manawatu Plains have developed into a regional and national economic powerhouse thanks to the system of drainage and flood protection that has evolved since the late 19th Century when farmers began digging drains to turn flood-prone swamp country into highly productive pastoral and arable land.

The Moutoa Sluice Gates and floodway, completed in 1962, are recognised as one of New Zealand's outstanding engineering projects of the 20th century. They still serve as a lynchpin of the vast and growing network of drains, stopbanks and floodgates that comprise the Lower Manawatu Scheme and protect the farms, orchards, market gardens and homes between the ranges and the sea.

In their first 40 years to 2002 the sluice gates were opened almost 50 times. Since then they have been opened on average every 15 months with the biggest test being the disastrous floods of 2004. In fact, 2004 was a particularly notable year for floods in the Manawatu River with the gate required to be opened six times.

The sluice gates and floodway played a key role in protecting the lower Manawatu Plain during the huge floods of February 2004.

Each time the gates are opened, they help speed the passage of floodwaters to the sea by releasing them into the 10km floodway that bypasses the 30 km of slow-flowing meandering channel of the lower Manawatu River around Koputaroa and Moutoa.

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While Horizons Regional Council continues to invest many millions of dollars in building new stopbanks and increasing the effectiveness of existing systems, the Moutoa Sluice Gates remain a crucial component of the Lower Manawatu Scheme. Being able to open the gates when significant flooding threatens means many thousands of hectares and hundreds of homes downstream are spared the worst effects of flooding.

Background

The Manawatu River originates north of Norsewood in Tararua District, to the west of the Ruahine Ranges. It drains 6000 square km on its way through the Manawatu Gorge to the sea at Foxton. On this circuitous route it is joined by several major, fast flowing tributaries, both above and below the Gorge, including the Mangatainoka, Tiraumea and Mangahao Rivers and the streams of the South East Ruahines above the Gorge, together with the Oroua, Pohangina and Tokomaru below the Gorge.

During dry periods cattle graze the diversion channel upstream from the sluice gates to the Manawatu River.

On reaching the wide Manawatu Plain the river adjusts to a shallower gradient and meanders over the last 48 km of its journey, with a fall of just 18 cm per km. The Manawatu Plain was formed from silt carried downstream by the river. Much of this flat expanse of land is at sea level or below and consequently the area can flood easily.

Lower Manawatu Scheme

Hand-dug drains were a feature of the low-lying swampy areas since the 1880s and the arrival of mechanical digging equipment in the 1920s enabled large areas of previously boggy land to be drained and successfully farmed. The drains also provided some protection against flooding and prior to the establishment of the Manawatu Catchment Board in 1944, various river and drainage boards installed stopbanks and greatly improved the natural drainage and flood protection on the plain.

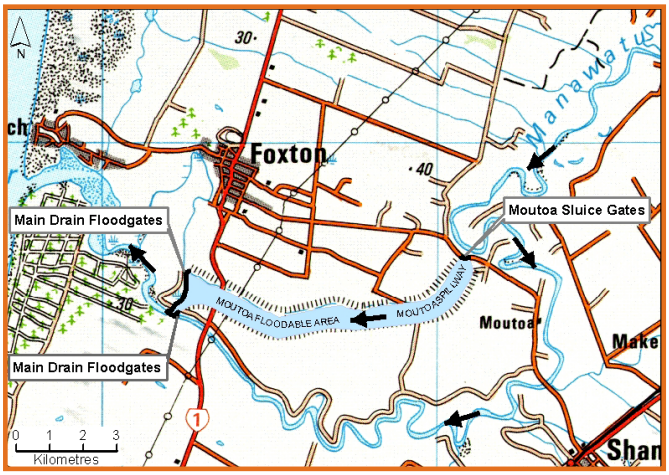
But a devastating flood in 1941 confirmed that effective, co-ordinated flood protection was badly needed. The Lower Manawatu Scheme was designed in 1946 by Paul Evans, Chief Engineer of the Catchment Board. His brief was to protect 280 square km of pastoral, horticultural and urban land between Ashhurst and the sea. His design included the Moutoa floodway and the sluice or flood gates.

The design incorporated stopbanking along most of the Manawatu River from the Gorge to the sea, some of which was already in place when the scheme was given its first major test in the

flood of 1953. Only with significant help from the army in laying sand-bags, was the flood water contained. It was obvious that sluice gates were needed and they were built between 1959 and 1962.

The Moutoa Floodway

Located on the Foxton-Shannon Road, south of Opiki and just above Moutoa, the gates are able to divert water from the main river into a specially designed 10 km floodway that rejoins the river at Whirokino.



The 10km Moutoa floodway bypasses 30 km of meandering channel as the Manawatu River makes its way to the sea at the Foxton estuary.

The floodway bypasses the 30 km of slow-flowing, meandering channel that can easily flood and pour water over many hectares of valuable land. It is 600 m wide and is bounded on both sides by stopbanks 5.5 m high.

Several features of the design prevent the floodway from being damaged by flood flows:

- energy dissipation blocks immediately adjacent to the gates reduce the speed of the water as it comes under the gates
- the curved shape of the structure enables the water to fan out and spread evenly across the floodway
- the floodway rises slightly away from the gates so the water has room to pool and does not gouge out a channel.

The Moutoa Sluice Gates

The curving reinforced concrete structure contains nine steel radial gates, each 15 m wide by 4.5 m high and weighing 15 tonnes. They are raised by a pulley system attached to the concrete piers and are operated by a series of electric motors. Each gate can be operated independently and standby power is available in case of electricity failure. The present day replacement value of the gate structure is assessed as $23 million.

The curving reinforced concrete structure that contains the nine gates, each 15 m wide by 4.5 m high, was completed in 1962 and was valued at $23 million in 2009.

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To open or not to open?

The gates are ready to be opened at any time should they be needed and Horizons staff are trained in their operation. The skill of controlling the flood water effectively is in judging the correct time to open, and subsequently close, the gates, by how much and how quickly. When fully opened they allow 2450 cumecs of water to pass through.

The nine gates at Moutoa are raised by a pulley system powered by a series of electric motors. Operations are controlled from this nearby building.

The decision to open the gates has to take into account a number of factors. The point at which the gates are raised is timed according to the amount of water flowing, not only down the main Manawatu River, but also in tributaries swollen by local rainfall, such as the Tokomaru River. If the gates are opened too soon or too quickly, the riverbed and banks may scour upstream and water flow in the main river will slow down. This will accelerate silt build-up in the riverbed, further restricting the flow of water along this meandering stretch. The gates are opened alternatively over approximately 40 minutes. Initially, they need to be opened very slowly to prevent a wave surging down the floodway and damaging both land and stopbanks.

Opening the gates in flood conditions has no effect on flood levels in Palmerston North city or on the drainage of water from low-lying land on the Manawatu Plain. By the time conditions have made it necessary to open the gates, natural drainage from lower lying areas will have ceased. The river, contained by stopbanks, will be at a higher level than much of the surrounding land. This means that gate opening can be delayed until the maximum operational level of the gates is reached. It will not disadvantage those with land upstream of the gates, but will avoid the floodway being under water longer than is really necessary.

The gates are not kept open at the maximum operating level for longer than is absolutely necessary. They are shut down slowly as the river falls, to avoid any sudden changes in water level and to ensure the maximum flow possible is retained in the main river channel in order to minimise silt deposition.

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