

# Heritage waterwheel, Pukekura Park.

## **Historical.**

Introduction of a waterwheel into the Park was a suggestion made by JW Goodwin in a report he was asked to submit in 1949 on attractions "to bring visitors back to the Park." It was partly luck when the wheel came to my attention in Feb. 1973 as the result of visiting the Omata Dairy Factory where it had been the source of power until the mid-thirties. Consequently it was in a very derelict condition but all the ironwork and bearings were confirmed by experts to be in good condition so I sought and gained authority to have it restored and installed in a totally neglected and inaccessible dell near the Playground.

The relics were donated to the Park, Fitzroy Engineering uplifted, transported and 'cleaned them up' free of charge and the late Ian McDowell prepared accurate scale drawings from which Jones & Sandford were commissioned to reconstruct the two identical halves.

Meanwhile Ian and I involved our respective teams, when time could be made available, in the complex preparation of the site. We endeavoured to exploit the full landscaping potential of the dell, including the uniquely intimate opportunity to conduct visitors behind the wheel by constructing an elevated walkway providing access under the headwater and bypass flumes. In order to centralise the location of the wheel we deflected the existing flume out of line and installed a controllable gate to feed the headwater flume. The passage of time has proven the latter decisions to have been unfortunate because the increasing propensity of the stream to rapidly overload in heavy rainfall has resulted in an inevitability of overflow at the junction of the flumes. This imposes an exceptionally heavy loading on the wheel as elaborated in item 7 of my ponderous letter dated 28<sup>th</sup> May 2003 which focussed on the consequent high risk of disintegration and threat to the performance of the Gilbert St culvert.

Work started on the site in the summer of 1974 under the guidance of the late Alex Brodie, a member of the Pukekura Park Committee with a civil engineering back-

ground. Assembly of the wheel began in 1975 and it was commissioned as the centennial project on 29<sup>th</sup> May, 1976.

Assembly presented a great challenge because we were anxious to preserve the unique stand of mature kamahi (*Weinmannia racemosa*) trees which stabilised the upper rim of the dell and are not common elsewhere in the Park. Mobile cranes with telescoping derricks of sufficient size to handle the estimated one tonne load were not then available and being unwilling to cut an arc through the trees, we opted to divide each half of the wheel into two sections then in turn carry each, in addition to the main shaft and bearings plus the counter-shaft, down the new path and assemble the wheel on site. The first two three-spoke sectors were relatively easy but positioning the second two without the aid of an overhead gantry proved to be very problematic. It is not difficult to imagine the sense of irony and sadness I felt when recently those kamahi plus a picturesque foreground plant of Himalayan dogwood, present as a young specimen in a pre-1908 photograph were all felled!

### **Mechanical.**

I cannot claim to be an authority on waterwheels but what little I do know tends to give me reason to believe that this wheel could be unusual in design and by virtue of its authentic reconstruction, therefore of great heritage significance. I have a catalogue illustration of a wheel with 'segmental spur-wheel fixed on the shrouding' for power take-off but the teeth are outward facing whereas on this one they face inward. In working life it drove heavy slow-rotation butter churns and I find it fascinating that the radial power output geared up to 12:1 would then have to have been broken back down whereas if a wheel with power taken off axially from the main shaft had been installed that would not have been so. Perhaps a demand for rotational speed in other equipment dictated the choice. Be that as it may, the manager confirmed that in every churning there was a phase when the wheel was subjected to such a high level of overload that it had to be dis-engaged to gain momentum then be jolted back into service to complete the process.

After such heavy impact loading the wheel had to be regularly restored back to trim. The hub of the half delivering the power is rigidly locked to the axle with a keyway and key but the idling half had a tolerance of several millimetres packed up with thin steel shims and wedges. In down-time a person would enter the wheel and tap back into place any that had been dislodged then the tierods would be re-tensioned if required.

The wheel was calculated (I think by a class at the Polytechnic) to have a power output of 4.5 bhp (3.5kw). I am aware that there are a great many variables to be taken into account when making such a calculation and this could no doubt account for the difference in a claim in the catalogue noted previously that their wheel of 12ft x 6ft dimension developed 18.5 hp.

In our naivety and ignorance we presumed that as the wheel was so ruggedly constructed and would never be laden, it would just idle away merrily for years without any need for re-trimming but this dream was soon shattered. The relentless rotation repeatedly destroyed the shims and wedges despite efforts to overcome the problem and the structural strength progressively deteriorated. Numerous clever and generous people endeavoured to rectify the hub instability and in 1989 and again in the 1990s the wheel was actually removed for thorough overhaul. In the course of these modifications the means by which the hubs were attached to the main shaft lost their simplicity and were

changed almost beyond recognition. Despite all these noble efforts the wheel has continued on its pattern of progressive self-destruction.

With the benefit of hind-sight it becomes more obvious that an otherwise symmetrical and balanced wheel loaded only on one rim with hundreds of kilos of cast-iron is inevitably in self-destruction mode from its first revolution. It is therefore totally reliant on regular attention in order to ensure continued performance --- in other words, not well suited to the purpose to which we put it.

#### **Placement of the wheel after removal.**

There is a great temptation to retain the wheel at some other location in the Park. I do not feel that this would be an appropriate solution for the following reasons:

- On a human scale it is a massive construction, difficult to integrate into the landscape without looking totally incongruous like a battleship on dry land.
- To have two waterwheels in the Park would be somewhat confusing to visitors. Which would be the **real** one? Each may detract from the other to the detriment of both.
- By any standards the wheel appears to be of historical, heritage and mechanical significance. It justifies safe preservation under cover. It is difficult to envisage where this could be provided in the Park.

#### **Potential catalyst for establishment of a 'Waterpower Museum.'**

The wheel has become such a popular icon that perhaps in retirement it could form the nucleus for a visitor attraction based on waterpower.

The Alpha flourmill site beside the Huatoki has considerable archaeological significance but in recent times has fallen into neglect. With the foreshore such an established success it seems likely that attention in the future will focus on upgrading the passage of the stream through the town and it seems inevitable that this historically rich upper section will see changes. There appears to be sufficient space on the mill site to construct a building appropriate for housing the wheel and to allow for an easy-gradient access path down from Carrington St. A couple of restricted-time parking sites handy on Carrington St would solve visitor access problems.

In the interests of the welfare of both the wheel and the public it would probably be wise to screen the wheel from actual contact. Were this to be done, it wouldn't take much ingenuity to devise a device which would, say every hour during daylight, release onto the wheel a small bag of sand to introduce that awesome spectacle of movement.

To add interest and significance, the millstones in Queen St which originate from the Alpha Mill could be returned home and no doubt once the potential was publicised there

would be other waterpower artefacts for which the site would be deemed an appropriate place for lodgement.

**Storage safeguard.**

Whatever decision is made over the retirement of the wheel, especially if storage is involved, it is very important that the bearings, bearing beams, counter-shaft, control gate and plaque be kept together as a single entity.

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It is disappointing contemplating removal of a feature with which one has been so closely involved and for which there seemed to be a prospect of bringing pleasure to visitors for a much longer period of time but in taking all the factors into account I agree that the decision to replace the wheel is a wise one. If, in the so-doing, a means can be found of preserving its unique characteristics for the education and enjoyment of future generations then the action is all the more for the greater good. So be it.

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George Fuller. Extracts from a summary  
dated Oct. 2004.