maitland

city council

THE WALKA WATER WORKS

HOW DID IT WORK?

THE OPERATION OF THE WALKA WATERWORKS (AN OVERVIEW)

Walka Waterworks was deliberately located adjacent to the Walka Lagoon, approximately one kilometre from the Hunter River. An earth embankment was constructed across the end of the lagoon creating a reservoir with a storage capacity of 175 million gallons. A bye wash at the southwestern end provided for overflow of the reservoir and a valve at the same location allowed the reservoir to be lowered or emptied.

Pumps located in the main pump house at the north-eastern end of the reservoir drew water from the Hunter River through a suction main 5'5" in diameter which was housed in a tunnel on account of the raised level of the ground between the pumps and the Hunter River. The suction pipe within the river was protected by a strainer and could be raised or lowered to suit the water level. Usually the water from the Hunter was sufficiently clear to be pumped directly into the settling tank. On occasions when the water was too muddy it was pumped from the river to an outlet at the western end of the reservoir and from an intake at the eastern end to the settling tank.

The settling tank was located on a high point within the site in order to give the maximum head of water for gravity feeding. This tank had a 1.3 million gallon capacity. From the settling tank the water flowed by gravitation to the four (later 6 and finally 7) filter beds. The filtration layers within these beds consisted of two courses of dry brick, washed river gravel and clean sand. It was normal for one filter to be out of operation being cleaned. Cleaning was carried out by drawing off the water and scraping off a layer of dirty sand. From the filter beds the water was again transmitted by gravity to the circular clear water tank, which had a capacity of 200,000 gallons. This tank was covered to prevent intrusion of foreign material.

From the clear water tank, water was pumped through cast iron pipes to summit reservoirs at East Maitland and Buttai. From Buttai it gravitated to reservoirs at Tyrrell Street Newcastle, The Obelisk Newcastle, Shepherds Hill Newcastle, The Glebe, Lambton, Wallsend and Minmi and thence to its consumers.

Crucial to the operations of the Waterworks was the pumping station complex which occupied a series of interconnected brick buildings to the east of the tank system. The pumping station conveyed water from the Hunter River to the settling tank or reservoir outlet; from the reservoir to the settling tank and from the clear water tank to the Buttai and East Maitland summit reservoirs.

Three vertical beam engines manufactured by James Watt and Company of Soho and Birmingham initially provided the power which drove the pumps. These engines were located within the main pump house. Each averaged thirteen to fourteen revolutions per minute and worked two main bucket and plunge pumps. Both high and low lift pumps were used. The high lift pumps transmitted the filtered water to the summit reservoirs while the low lift pumps provided water from the Hunter River or reservoir or the setting tank.

An intricate system of pipes and valves linked the pumps and tanks. Steam was provided by a bank of five Lancashire boilers each 28' long and 7' in diameter housed within the boiler house and connected by flue to the nearby chimney. All of the abovementioned facilities were operational by 1887. Between 1892 and 1913 a number of alterations and additions were made to the facilities at the waterworks. These changes were by way of expansion and did not dramatically alter the general water processing pattern outlined above.

In 1892 the pumps were improved and a third pump was attached to the number three beam engine.

A duplicate pipeline to Buttai was constructed between 1896 and 1898.

Two additional filter beds were constructed in 1908.

A large amount if new equipment was installed in 1913. This included a pair of Babcock and Wilcox boilers which provided steam to new pumps and accessories including a vertical triple expansion three plunger pump engine, manufactured by Hathorn Davey and Company, which was installed and the seventh (and largest) filter bed and reservoir at Rutherford were also constructed.

With the completion of the Chichester Dam by 1924 no further equipment was installed at Walka. The Walka Waterworks were put on standby in 1925, shut down in 1931, (but regularly tested thereafter), last used to supply water for human consumption in 1940 and finally closed in 1945. The site was leased to the Electricity Commission of New South Wales for the construction of the Maitland Power Station in 1951.

The Maitland Power Station was one of the four coal or oil fired 'package' power stations erected by the newly constituted Electricity Commission of NSW. Other package stations were sited at Penrith, Casula and Port Kembla. They were built as a temporary measure to supply power for the post war industrial expansion before the new massive generating units such as Eraring and Munmora came on line.

Maitland was supplied with coal which was brought in by a spur line from the Great Northern Line. The coal was stored in the open to the east of the pump house. Cooling water for the condensers was obtained from the Walka lagoon.

The power house was situated to the south of the pump house and east of the lagoon. It measured about 80m x 100m and contained four super heater boilers and four 5000 KW (5000 Kilo Watts or 5 Mega Watts) turbo alternator sets.

Above each boiler there was a coal bunker which dropped coal into the spreader staker boilers. The coal was raised to the hoppers by an elevated conveyor belt.

Cooling water was drawn from the lagoon close to its north eastern corner. It was pumped to two square wooden cooling towers which had been built on filter beds 2 and 4. This water them gravitated to the condensers which were situated below the individual turbo alternator sets. The warm water from the condensers was pumped back to the Cooling towers to be cooled mixed with some top up water from the lagoon and reused. Economic and pollution consideration caused oil to be used, at some times, for fuel. Two huge circular welded steel oil storage tanks were built in filter beds 5 and 6.

Very little remains of the electricity generating technology. The main legacies are the raised floor of the pump house, numerous kerbed roads, the road which ringed the powerhouse, the line of the permanent way, the foundations of the cooling towers and storage tanks and numerous smaller structures.

DESCRIPTION OF MAJOR FEATURES

As the main complex building fabric is not dealt with in this report, reference is only made to building details where these are directly relevant to the function of the site.

1.0 MAIN PUMP HOUSE

1. The main pump house is a two storey polychrome brick structure, with walls which are in some places one metre thick owing to the need to support the machinery it housed. The walls reduce in thickness some distance above the first floor. The existing six pane windows are believed to replace original nine pane windows destroyed during 1949 when the machinery was being removed.

2. The basement is understood to be approximately 10m deep. This depth was required to set the pumps it contained at a level near that of the Hunter River. The basement is now filled with rubble and the precise details

of its construction are not known. Remnants which may remain include brick engine beds, engine bearings and possibly components of the large engine flywheels which were broken up and removed in 1949. Below the present ground floor, which was inserted during the 1950's, the bases of the first floor cast iron support columns remain. Also present are the original intake and outlet pipes which can be inspected via a man hole and rickety iron ladder immediately east of the pump house.

3. The ground floor of the main pump house initially contained the flywheels and valve chests of the three beam engines. Six cast iron columns which support the first floor are still present, but all other original features have now been replaced, or obscured by a raised floor, office partitions and a stairway to the first floor constructed by the Electricity Commission in the 1950's. The raised floor necessitated the construction of the new external stairs and doorway within the original entrance. The Electricity Commission's work is easily discerned by its timber framed construction.

4. The first floor of the main pump house best illustrates the building's intended and original use. Though now a large well lit space, this area retains a sufficient number of fixtures to demonstrate its previous operations. The floor is supported by 6 cast iron cross beams over a cast iron longitudinal beam, itself supported by the 6 cast iron columns from the ground floor. All of these components were manufactured in England. Cast iron shoes on the side of the cross beams house timber floor joists. Original sections of the flooring remain around the openings in the floor (between pivots) for the engine beams. These openings have subsequently been timbered, at a higher level than the original floor.

5. At the top of each cast iron column is a bearing block which supported the beam engine pivot. These are laterally stabilized by pairs of cast iron joists, which framed the beam openings and were embedded in the pump house walls. A large sandstone block is located within the walls, above and below each pair of joists, presumably to provide stability. It is possibly that these blocks are strapped together, for additional strength, as is the case at a number of English pumping stations.

6. There are pilasters along the longitudinal walls which contain steel rods (18mm diameter), threaded as fixing lugs for a gantry crane beam. This crane was used in servicing the three beam engines. A series of cruciform vents with decorative cast iron grills are located towards the top of the walls. The original colour scheme; black band, remains. The roof structures a series of bolted/wrought iron trusses which span the building. The roof above has a matchboard timber lining.

2.0 BOILER ROOM

1. The original boiler room is attached to the northern end of the main pump house, it was built in four single storey bays and housed four Lancashire Boilers which provided steam for the beam engines.

2. The roof is double hipped and clad in corrugated iron, being drained by one central and two perimeter box gutters. The mild steel or wrought iron roof trusses feature forged components and are understood to be original. It is certain that the roof has been modified as historical photographs show roof ventilators which are now gone. The boiler room was used as a store during the occupancy of the Electricity Commission. It was at this time that the concrete floor was laid and cast iron roof support columns were removed. The column capitals remain beneath a more recent longitudinal beam. Other surviving features which relate to the function of this structure are the steam header access hole in the southern wall, through which steam travelled to the beam engines, and the flue, centrally located in the western wall, which connected the boilers to the nearby chimney stack. Other noteworthy elements are the access door to the engine room and the western wall which features three pairs of windows beneath relieving arches in the brickwork – an unusual and attractive configuration. Recent artefacts within the boiler room are not regarded as significant.

3.0 CHIMNEY

1. A thirty six metre polychrome brick and sandstone chimney stands immediately west of the boiler room. The base of the chimney, which is square, has been partially covered by fill. The square base translates through an

octagonal section to become a tapering cylinder, terminating in finely corbelled brickwork. A flue leads to the chimney from the centre of the western wall of the boiler room. A cast iron atmospheric exhaust which is attached to the boiler room exterior wall is possibly associated with an economiser erected on this site in 1913.

4.0 EASTERN EXTENSION TO PUMP HOUSE

1. The erection of an eastern office to the main pump house in 1893 was the first extension of the complex. As is the case in the main pump house original nine pane windows have been replaced by six pane windows. An extremely unsympathetic entrance and set of stairs have been inserted in the southern wall of his structure. Internally it contains amenities installed by the Electricity Commission in the 1950s. A number of recent fittings which consist predominantly of redundant plumbing fixtures are attached to the exterior of the building.

5.0 WESTERN PUMP HOUSE

1. The western pump house was built in 1913 to house a new triple expansion engine installed to increase the Waterworks output. The building abuts the main pump house and its form and detailing successfully reflect the original building. Its construction required the bricking in of the openings to the main pump house and removal or relocation of the original window joinery. The existing nine pane windows on the western side of this building are probably the only remaining original windows of the complex. One ground floor window in the main pump house was converted to a double door. The internal brickwork is rendered and painted but along its eastern side it retains the profile of the exterior of the main pump house. The roof trusses of riveted steel are exposed. A concrete floor was installed after the water pumping machinery was removed in 1949. This floor seals the basement area, which may contain significant artefacts. The southern wall of the building was deliberately constructed of timber and corrugated iron to enable further expansion.

6.0 WORKSHOP

1. The workshop is a small single storey building, to the north of and separate from the original boiler-room. Its original function is not known but may be ascertained through archaeological investigation of the four cast iron chutes which penetrate its northern wall. This wall is a retaining wall, built against an embankment which defines the northern boundary of the pumping station building complex. This wall is angled with a buttressed base and weepholes. Concrete steps adjacent to the east lead to the road above. The building has most recently been used for storage and still contains fire bricks for use in the Electricity Commission boilers.

7.0 BOILER ROOM ADDITION

1. A lean-to roof and western wall of corrugated iron over a timber frame was erected between the workshop and boiler room in 1913. This addition housed two new boilers which provided steam for the expansion engine in the western pump house and another engine in a pump shed (now gone) built close to the chimney and boiler room, also in 1913.

8.0 SETTLING TANK

1. The settling tank is a large (220' x 115' x 10') rectangular tank located to the northwest of the pump house complex. Its walls are sandstock brick, covered with concrete. This tank has not been filled and remains largely intact, as do several of its associated artefacts and components including a vertical iron inlet pipe on the eastern side, an outlet and overflow pipes on the southern side and a height gauge and ladder. A steep set of concrete steps, centrally located lead south down an embankment to the filter beds.

9.0 FILTER BEDS

1. The seven filter beds were constructed in three stages. Beds 1 to 4 were laid out in grid fashion about a central north/south pipe. All were built of sandstock bricks. Beds 2 and 4 have been damaged by the erection of concrete bases for cooling towers associated with the 1950s power station. Beds 1 and 3 have been buried with ash fill until recently when their brick rims were uncovered. It is likely that they remain substantially intact. Beds 5 and 6 were added in 1908 and are of different construction, featuring off-form concrete walls with pre cast

concrete cappings. Circular concrete bases for Electricity Commission oil tanks were constructed in these beds in the 1950s. The largest filter bed, number 7, was built in 1913 in a similar design to beds 5 and 6. It is now filled, but its existence in reasonable condition has been confirmed by recent uncovering of its edges. It is possible that filtration layers of sands, gravel and brick remain in silt within beds 1,3,5,6 and 7.

10.0 CLEAR WATER TANK

1. The clear water tank was located below the filter beds to allow for a gravity feed. It is finely constructed in brick. Evidence of the roof line may be seen in the brick piers around its rim. Iron supports for this roof have been removed. The western side of the rim features handsome gate piers with brick caps. The intake, outlet and overflow pipes associated with this tank remain in situ.

11.0 RESERVOIR

1. The reservoir edge on its northern and western sides follows the natural land contours. Along the southern and eastern ends it is bounded by an earthen embankment made from material excavated during construction of the tanks, filter beds and pumping station. Its internal face is lined with Ravensfield sandstone blocks.

2. A brick bye wash is located at the southwestern extremity of the reservoir. The bye wash is four metres wide and two metres deep and was built to provide an overflow for the reservoir. It presents an arched, buttressed brick face, covered with concrete render, to the reservoir. Overflow water ran down a brick channel and into a pipe which conveyed it to the Hunter River. The bye wash also contains a large valve which could be opened to lower the water level or drain the reservoir.

3. A circular brick structure with an iron trap door to prevent reflux flow is centrally located on the north bank of the reservoir. It is believed that this was the termination of a pipe used to conduct water directly from the Hunter River to the reservoir, for initial settling, at times when flooding or other turbulence meant that the water was too muddy to be pumped directly to the settling tank. Intake from the reservoir was via a small valve house which is still present about 30 metres from the reservoir eastern wall.

4. A discharge cooling channel, which was constructed to service the power station, runs parallel with the northern bank of the reservoir from its northeast corner. The channel was formed by the construction of an east/west rectangular causeway, built of local rubble, at the time of the construction of the power station. The causeway is punctuated by the ruins of sluice gates in two places.

12.0 SITES

1. There are a number of structures which played significant roles in the history of the Walka Water Works scattered over the site. The important ones are discussed below.

2. The chief Engineer's residence was located on the most elevated portion of the site, to the northwest of the settling tank. From here it is possible to view the entire complex. The residence, which was built sometime after 1882 was a nine room brick cottage. Substantial footings and rubble associated with this cottage remain, as does a tennis court and an approach road flanked by plantings of introduced trees.

3. A cottage for the Second Engineer was formerly located on the southern bank of the reservoir, west of the bye wash. This was a six room brick cottage which was demolished in 1975. The footings of this cottage remain.

4. Four small brick cottages, each with seven rooms were built to the north of the main complex, near Scobie's Lane during the 1880's, for the use of waterworks employees and their families. There were demolished in 1975. Little visible evidence remains, although it is possible that footings and/or other sub-surface features are present.

5. Photographs of the complex taken after its abandonment in 1947 show a hipped roof washhouse immediately south of the western pump house. A small gabled structure can also be seen, immediately west of the chimney. Little is known of either of these structures.

6. In 1913 an economiser and a pump shed were constructed between the chimney and boiler room. It is believed that the economiser was used in connection with the triple expansion engine installed in the western pump house at this time. An iron or steel atmospheric exhaust which is adjacent to the boiler room exterior wall may have been part of the economiser equipment. The pump that was housed in the pump shed is understood to have been used on the rare occasions when it was necessary to pump from the reservoir to the settling tank. With the exception of the iron exhaust, no remains of either of these structures are visible, but extant features may be obscured around the base of the chimney.

7. In 1951 the Electricity Commission of New South Wales erected one of the four prefabricated power stations, purchased from the United States at Walka. A number of features and alterations constructed as a result have already been outlined above. The plant itself was situated on the area of flat cleared land immediately to the south of the main pump house. The power station was decommissioned in 1976 and demolished in 1978. Substantial footings and other remains are clearly evident at the site.

13.0 MISCELLANEOUS FEATURES

1. Apart from the major structures and other elements associated with the history and operation of the complex outlined above, the Walka Waterworks site contains a number of other significant features.

2. There is an extensive system of concrete paved roads, paths and kerbing, particularly around the main pump house, western pump house and associated structures which was installed by the Electricity Commission in the 1950s.

3. Associated with the 1950s roads paths and kerbing are remnants of the planting scheme installed at the site by the Electricity Commission. Precise identification of the features associated with this phase is beyond the scope of this report.

4. The site contains a sparse scatter of plantings which date from the original period of its operation. These include an avenue of trees which runs near the site of the Chief Engineers residence. It is clear, from historic photographs, that much of the early planting around the main pump house complex no longer exists. Detailed analysis of early planting schemes or their remnants is, again, beyond the scope of this report.

5. A substantial railway formation, including cutting and embankments runs from the site of the power station along the northern edge of the reservoir and connects to the North Coast Railway main line at the western end of the site. Some sections of railway track remain in situ, particularly in the vicinity of the power station site. The railway line was constructed by the Electricity Commission in order to provide transport of coal to the power station. A meandering vehicular track which generally follows the railway line along the northern side of the reservoir is presumed to be an access track used for servicing the railway.

6. The site features a great number of fences, the functions and origins of which have not been considered in this report.

7. The existing pipe network consist of original cast iron pipes varying in diameter from 10 inch (250mm) to 30 inch (750mm) and steel pipes of a smaller diameter which were associated with the Power House. The original pipes can be seen in inspection holes which exist in the pathway between filter beds 1 and 2 and filter beds 3 and 4.

8. Fuel oil was unloaded via pipes which ran from the railway spur to tanks erected in the filter beds 5 and 6. The steel steps and concrete footings for the fuel air pump house can still be seen at the edge of the rail track below filter bed no. 7.

9. There are no surface remains of the sand washing plant. One plant was adjacent to filter bed no. 7 and one was adjacent to filter bed no. 4. Their operations are unclear and it is not known whether the plant was mechanised or even if it was covered.

STATEMENT OF SIGNIFICANCE

1.0 SUMMARY

1. Walka Waterworks is one of the largest and most intact nineteenth century industrial complexes in the Hunter Valley.

2. The surviving water treatment features at the site constitute the most comprehensive set in New South Wales and clearly illustrate water filtration and reticulation processes and the major developments which occurred in these processes during the later nineteenth and early twentieth century.

3. The pump house, chimney and boiler house are elegant, finely executed polychrome brick structures in a traditional configuration which are located within an attractive landscape setting.

4. The entire Walk Waterworks complex including reservoir and tanks is an important local cultural landmark.

2.0 HISTORIC

1. The establishment of the complex was a major political and engineering achievement which finally provided a permanent supply of clean water to the residents of Newcastle.

2. Various changes and developments at the complex document the growth of the demand for water. An expectation of further expansion is evidenced in the temporary nature of the southern wall of the pump house west annex.

3. The construction of Walka Waterworks and its subsequent expansion (and demise) were vital stages in the establishment and growth of the Hunter Valley Waterboard.

4. Prominent hydraulics engineer, William Clark and a number of other noteworthy individuals were closely associated with the design, construction and expansion of the complex.

5. The ultimate demise of the site as a water treatment plant and its subsequent development (and demise) as a power station, documents significant periods of growth and change in the local community.

3.0 AESTHETIC

1. The combination of elegant polychrome brick buildings, filter beds, tanks and reservoir with the nearby topography creates an element of considerable cultural interest and beauty within an already attractive landscape.

2. The pump house, chimney and boiler house are finely executed polychrome brick structures which feature a degree of uniformity in materials, form and scale that is typical of many nineteenth century public buildings.

3. The entire Walka Waterworks site has been largely unmarred by the construction of any unsympathetic developments. The reservoir catchment continues to provide a pleasant rural curtilage to the complex.

4.0 TECHNOLOGICAL

1. The complex clearly illustrates nineteenth century water treatment filtration processes. The extant configuration and substantial remains of all major components of the complex, including evident remains of machinery locations and ancillary structures, such as pipes, enables the processes carried out to be clearly understood.

2. The site features a largely intact set of Victorian industrial structures which typify the building associations of a nineteenth century technology.

3. The evolution of the complex over time provides evidence of the development of steam technology from beam engines to reciprocating engines.

4. The complex is the only complete set of nineteenth century water filtration equipment extant in New South Wales.

5. The power station at this site was one of 4 which were built during the Post World War II boom. The railway, kerbing and other remains of the power station document its deliberate location close to necessary resources and illustrate the flow of processes carried out.

6. The oral history of the complex has been extensively documented in a form which lends itself to interpretation of the site to the public.

5.0 SOCIAL

1. The Walka Waterworks complex is an outstanding resource for the interpretation of the importance of nineteenth century industrial processes.

2. For many years the Walka Waterworks has been a cultural landmark to the people of Maitland and the Hunter Valley.

This study by Don Godden and Associates Pty Ltd has been extracted from *'Specialist Reports for Walka Waterworks Conservation Plan'* Tresev Pty Ltd 1986