
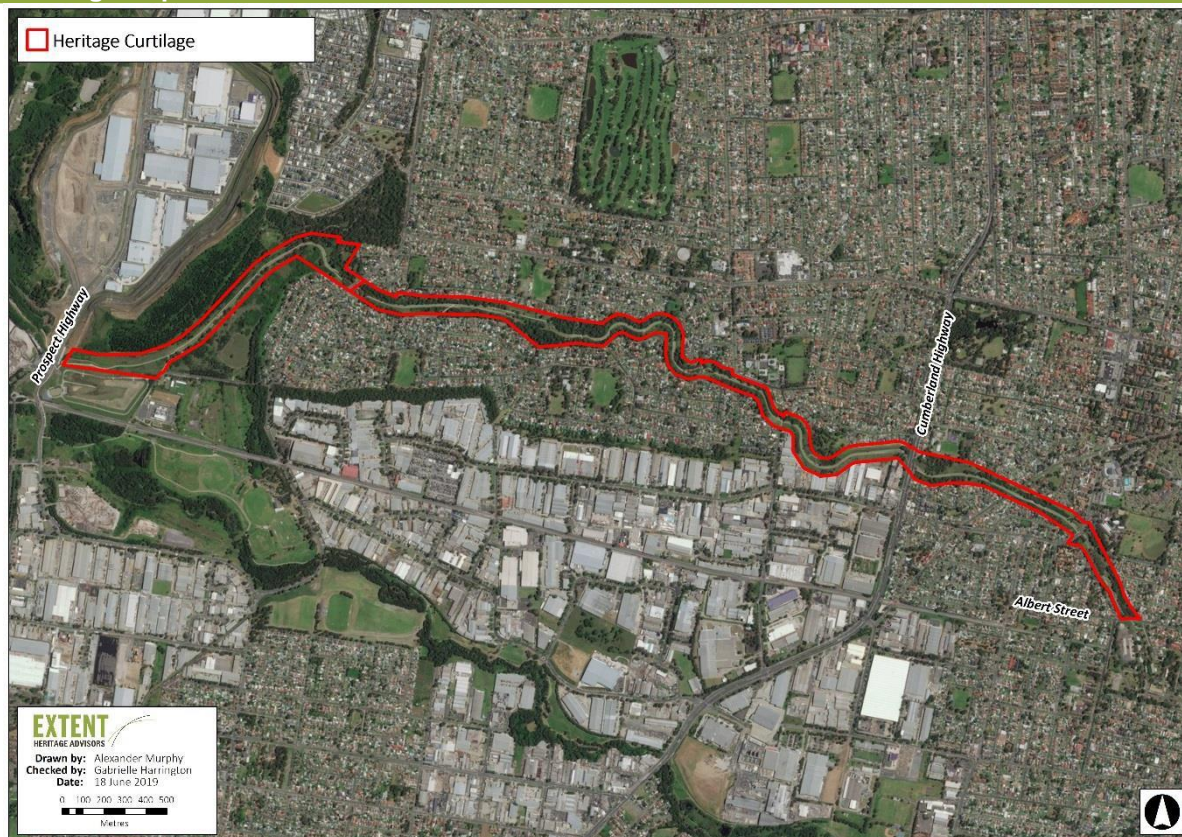


Heritage Inventory Sheet

Item Name	<p>Lower Prospect Canal Reserve;</p> <p>“Boothtown Aqueduct”;</p> <p>Footbridge over Lower Prospect Canal; and</p> <p>“Boothtown Aqueduct” (previously Greystanes Aqueduct), Aqueduct Valve House No 1, Aqueduct Valve House No 2, Culvert No 1 under Aqueduct, Culvert No 2 under Aqueduct, Lower Prospect Canal Reserve and garden</p>		
Recommended Name	Lower Prospect Canal Reserve		
Site Image			
Address	Greystanes; Guildford; Guildford West, NSW, 2145		
Lot/Section/DP	10, 12, 14, 16, 18	-	221011
	2, 4, 6, 8	-	221011
	1, 3, 5, 7, 9, 11, 12	-	221012
	1, 3, 5	-	222245
	1, 2	-	222247
	1	-	225807

	1	-	225808
	1	-	225809
	1-3	-	225811
	1-4	-	235064
	1	-	513204
	1	-	708007
	2	-	865978
	1	-	952529
Draft Cumberland LEP ID	01945 (State) Lower Prospect Canal Reserve; I128		
Former LEP ID	A2 (Holroyd), “Boothtown Aqueduct”; I29 (Holroyd), Footbridge over Lower Prospect Canal; I52 (Holroyd), “Boothtown Aqueduct” (previously Greystanes Aqueduct), Aqueduct Valve House No 1, Aqueduct Valve House No 2, Culvert No 1 under Aqueduct, Culvert No 2 under Aqueduct, Lower Prospect Canal Reserve and garden		
Heritage Conservation Area	Not included		
Date Updated	March 2020		
Significance Level	STATE		
Site Type	Level 1	Built	
	Level 2	Utilities - Water	
Ownership			

Curtilage Map



Statement of Significance

The Lower Prospect Canal Reserve is of state significance for the former Lower Prospect Canal contained within the reserve and the natural heritage values of the reserve.

The Lower Prospect Canal, and its associated infrastructure including the “Boothtown Aqueduct”, is state significant as a key component of the Upper Nepean Scheme. This scheme was the outcome of the first major engineering investigation in NSW into the provision of an adequate and reliable water supply to meet the needs of a rapidly growing Sydney.

The Upper Nepean Scheme was Sydney's fourth water supply, and its first reliable, and most enduring, engineered water supply. It marked a major engineering advance from locally sourced to remotely harvested water, obtained from rivers in upland catchment areas, that was stored in dams and transported by weirs, open channels, tunnels and pipelines to its final destination.

The Upper Nepean Scheme was one of the largest engineering and public infrastructure works carried out in Australia up to 1888. It was an important determinant of Sydney's growth potential. No other similar water supply canals of the form and scale of those associated with the Upper Nepean Scheme have ever been built in NSW.

The scheme is a system that has lent itself to progressive development to meet Sydney's increasing water supply needs. It continues to function for the purpose for which it was designed and constructed. The Lower Canal functioned as a key element of the Upper Nepean Scheme for over 100 years. Apart from extensive upgrades in its first decades, the Lower Canal changed little in its basic principles during this period.

The Lower Prospect Canal is an excellent example of the techniques of 19th century hydraulic engineering, particularly the use of gravity directed water flow to supply a large area of Sydney with water.

The Lower Prospect Canal has research potential for its detailed and varied evidence of engineering construction techniques, both the original masonry and the later reinforced concrete upgrade works.

The Lower Prospect Canal is state significant for its reuse which involves reversible infilling along its entire length; has retained its capacity to demonstrate its original water supply function and assists in demonstrating the Upper Nepean System as an entity.

Large sections of the Lower Prospect Canal Reserve are identified within the biodiversity map of *Holroyd Local Environmental Plan 2013* as containing 'Remnant Native Vegetation', particularly shale plains woodland. Cumberland Plain Woodland is identified as a critically endangered species under both the *Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)* and the *Threatened Species Conservation Act 1995 (NSW)*.

Criteria Assessment

a) Historic

The Lower Prospect Canal is state significant as a key component of the Upper Nepean Scheme. This scheme was the outcome of the first major engineering investigation in NSW into the provision of an adequate and reliable water supply to meet the needs of a rapidly growing Sydney.

The Upper Nepean Scheme was Sydney's fourth water supply, and its first reliable, and most enduring, engineered water supply. It marked a major engineering advance from locally sourced to remotely harvested water, obtained from rivers in upland catchment areas, that was stored in dams and transported by weirs, open channels, tunnels and pipelines to its final destination.

The Upper Nepean Scheme was one of the largest engineering and public infrastructure works carried out in Australia up to 1888. It was an important determinant of Sydney's growth potential.

No other similar water supply canals of the form and scale of those associated with the Upper Nepean Scheme have ever been built in NSW. The closest comparison to the Upper Nepean Scheme would be Melbourne's Yan Yean Water Supply Scheme which is fundamentally similar in concept and operation, but predates the Upper Nepean Scheme and is not as ambitious in scale.

The scheme is a system that has lent itself to progressive development to meet Sydney's increasing water supply needs. It continues to function for the purpose for which it was designed and constructed.

The Lower Prospect Canal functioned as a key element of the Upper Nepean Scheme for over 100 years. Apart from extensive upgrades in its first decades, Lower Canal changed little in its basic principles during this period.

The Lower Prospect Canal is state significant for its reuse, through reversible infilling along its entire length, that has retained the legibility in the landscape of its original water supply function which is capable of further enhancement through interpretation.

Large sections of the Lower Prospect Canal Reserve are identified within the biodiversity map of *Holroyd Local Environmental Plan (LEP)*

	<p>2013 as containing 'Remnant Native Vegetation'. The biodiversity map was created using data from the National Parks and Wildlife Service mapping of 'Vegetation of the Cumberland Plain'. This map identifies Cumberland Plain Woodland, particularly shale plains woodland, as being located within the Lower Prospect Canal Reserve.</p> <p>Cumberland Plain Woodland is identified as a critically endangered species under both the <i>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)</i> and the <i>Threatened Species Conservation Act 1995 (TSC Act 1995)</i>. The species was extensive across the Cumberland Plain (Western Sydney), however only a small percentage of the original extent remains intact and remnants are spread across the Cumberland Plain.</p> <p>The LEP, along with the EPBC Act 1999 and TSC Act 1995 are all applicable to the conservation of the remnant vegetation of the Lower Prospect Canal Reserve.</p>
b) Associative	<p>The Lower Prospect Canal is of state significance for its association with the NSW Public Works Department and Sydney Water and its antecedents. The NSW Board of Water Supply and Sewerage was constituted to be the managing authority of the Upper Nepean Scheme and was responsible for the design and construction of the Lower Canal.</p> <p>The Lower Prospect Canal is of state significance for its association with Edward Orpen Moriarty, Engineer in Chief for Harbours and River Navigation, NSW Department of Public Works as the designer and overseer of the Upper Nepean Scheme. Moriarty is a state significant person in the provision of water supply in NSW. He had previously controlled the building of water supply schemes for Bathurst, Wollongong, Albury, Wagga Wagga and Hunter Valley towns and served as a Commissioner on the 1867 Royal Commission into Sydney's water supply</p>
c) Aesthetic/Technical	<p>The Lower Prospect Canal has state significance for its technical values.</p> <p>It has the capacity to demonstrate techniques of canal building (often at extremely small grades); engineering practices (especially in the period 1888-1912) and land surveying, all largely within an era of horse and manpower.</p> <p>It is an excellent example of the techniques of 19th century hydraulic engineering, particularly the use of gravity directed water flow to supply a large area of Sydney with water. Hydraulic canal building largely ceased world-wide in the 20th century, in favour of pressure pipeline technologies.</p> <p>It is one of the earliest examples in NSW of the large-scale application of precast reinforced concrete construction.</p> <p>The Lower Prospect Canal contains a wide range of individual features including an infilled open canal, an aqueduct, an inverted syphon, reservoirs, bridges, sedimentation chambers, pre-cast reinforced concrete panels; culverts, flumes, scour valves and other elements which individually and collectively demonstrate the technologies and engineering approaches in use in the late 19th and early 20th centuries in NSW.</p>

	<p>All infrastructure associated with the Lower Canal has been identified and assessed in the Heritage Study of the Upper Canal, Prospect Reservoir & Lower Canal (Upper Nepean Scheme) 1992. This study found a majority of components were of potential state significance.</p> <p>The Lower Canal is state significant for its landmark qualities and reuse (through reversible infilling along its entire length) that retains its capacity to demonstrate its original water supply function. Retention of the Lower Prospect Canal's concrete edges along its entire length, together with large sections of only partially filled canal and the associated canal infrastructure, has enabled retention of the Lower Prospect Canal's capacity to demonstrate its original water supply function, and its part in the Upper Nepean System as an entity.</p>
d) Social	The item does not meet this criterion.
e) Scientific	<p>The Lower Prospect Canal has research potential at state level for the detailed and varied evidence of its various engineering construction techniques. These include its original masonry construction retained beneath its concrete lining upgrade; some of the earliest large-scale applications of pre-cast reinforced concrete construction, and late 19th century hydraulic construction techniques typical of state-of-the-art technology of the time.</p> <p>Retention of the associated structures (including the "Boothtown Aqueduct, Sedimentation Chambers, Smithfield Tank, Inverted Syphon and Covered Way) through reversible infilling provides research potential for further investigation of the construction techniques of these structures.</p>
f) Rarity	<p>The Lower Prospect Canal has state significance as a key component of a rare and extensive water supply system in NSW. It was one of only two such open water supply canals in Australia; the other being the Upper Canal within the same Upper Nepean Scheme.</p> <p>As the only component of that scheme that is currently decommissioned in its entirety, coupled with its urban location and public accessibility, the Lower Prospect Canal has a rare interpretative capacity for its role as an element in the overall Upper Nepean Scheme.</p>
g) Representativeness	The Lower Prospect Canal has state significance for its representative values of the principal characteristics of an extensive, engineered and enduring urban water supply system with the capacity for modification over time.

Physical Description

The following physical description is quoted from Office of Environment and Heritage State Heritage Register's listing sheet for 'Lower Prospect Canal Reserve' (2014).

Historical Description

The Lower Canal was originally around 7.6 kms long, measured from its commencement at the receiving basin next to the Lower Valve House at the eastern end of Prospect Reservoir to its termination at Pipehead basin, Guildford. The Lower Canal follows the edge of a natural ridgeline from the western end gradually falling to an artificial constructed embankment at the eastern end. The elevation of the western end of the canal is approximately 60-70m above sea level, falling to 40m. The Lower Canal was an open gravity flow canal with a gradient of approximately 10 cms per km over its entire length. The form of the canal was a V-shaped cross-section. The upper width varied between 5.8 and 7.25m and its depth between 2.4 and 3 m.

The canal was originally a dry-stone masonry construction (1888). From 1902-12 it was extensively rebuilt and relined to reduce leakage and increase carrying capacity and stability. Relining raised the

water level by c 75 cms. Two types of lining were used on top of the original masonry. Pre-cast Monier reinforced concrete plates lined the canal in cutting with in-situ-cast reinforced concrete lining where the canal was in embankment. A 30 cms wide concrete footing wall was also constructed behind the new lining on both sides of the canal to prevent outward movement of the canal walls. Rectangular concrete blocks, c. 30 by 45 cms, projected above the footing wall to be flush with the top of the canal's wall plates.

From west to east, the Lower Canal included the following features, most of which are extant in the infilled canal way (some overbridges, flumes and culverts have been removed):

- ◆ The Covered Way
- ◆ Culverts
- ◆ Boothtown Bridge (now Gipps Road bridge)
- ◆ Boothtown Aqueduct
- ◆ Boothtown Inverted Syphon (culvert and inlet and outlet Valve Houses)
- ◆ Smithfield Tanks/Reservoir
- ◆ Sedimentation Channel/Chambers
- ◆ A graded maintenance track parallel to and south of the Lower Canal
- ◆ The canal was crossed by eight stormwater flumes and eleven overbridges, six of which carried vehicular roadways.
- ◆ The canal had 18 culverts running beneath it, six of which operated as inverted syphons. There were five scour valves along its length.

Current Description

The Lower Prospect Canal Reserve is listed on Holroyd's Local Environmental Plan (LEP) 2013. The Lower Canal was incorporated into a public reserve in 1998 which follows the course of the former canal. The reserve is just over 6.6 kms in length, measured from Reconciliation Road, Pemulwuy to Pipehead, Guildford. It varies from 40m to 100m in width and covers approximately 54.6 hectares.

The proposed SHR curtilage for Lower Prospect Canal Reserve aligns with the Holroyd LEP listing. It commences at Reconciliation Road at Pemulwuy and extends through the suburbs of Greystanes, Smithfield, Merrylands and Woodpark to its termination at Pipehead, Albert Street, Guildford

The incorporation of Lower Canal into the Lower Prospect Canal Reserve from 1998 involved the retention of remnant Cumberland Plain vegetation and the regeneration of native flora and fauna on the former Water Board easement. The infilled canal is now flanked on both sides by managed reserve.

Large sections of the Lower Prospect Canal Reserve are identified within the biodiversity map of Holroyd Local Environmental Plan 2013 (HLEP 2013) as containing 'Remnant Native Vegetation'. The biodiversity map was created using data from the National Parks and Wildlife Service mapping of 'Vegetation of the Cumberland Plain'. This map identifies Cumberland Plain Woodland, particularly shale plains woodland, as being located within the Lower Prospect Canal Reserve.

The infilled canal is approximately 7m wide at its surface and has generally been infilled to reveal around the top 20 cm of the canal walls. A 3m two-laned pedestrian/cycle way is flanked both sides by 2m of grass to the canal walls.

Three roads with road bridges cross over the Lower Canal: Gipps Road, Cumberland Highway and Sherwood Road. The two latter have low clearance above the semi-infilled canal. There are also several small local road and canal overbridges along the length of the Lower Canal. As there is minimal clearance under two road, and all canal, overbridges the canal infill is considerably reduced at these points to allow pedestrians and cyclists passage beneath. Partial infilling here reveals approximately 5-6m of the 1912 Monier plated or concrete lined canal walls.

The pedestrian/cycle way follows the infilled canal its entire duration except where the canal structure changes to become the Sedimentation Chambers (west of Albert Street) and the Covered Way (east

of Reconciliation Road). Here the pedestrian/cycle way diverts alongside these structures for their duration.

On the southern side of the infilled canal is the 1914 graded maintenance track. This follows the Lower Canal its entire distance from the Covered Way to Pipehead.

Medium density residential housing borders the reserve to the north and south with light industry located to the south around Smithfield.

The Lower Canal flowed from its commencement at Prospect in an easterly direction to its termination at Pipehead. The receiving basin, Valve House and initial length of the infilled Lower Canal at Prospect Reservoir are included in the SHR listing for Prospect Reservoir and surrounding area (SHR No. 01370). A 100m section of the infilled Lower Canal on the western boundary of the Prospect Reservoir SHR listing was removed in 2008 for the construction of Reconciliation Road.

Prospect (eventually Boral) Quarry was located to the east of Prospect Reservoir, on the flank of Prospect Hill, mining gravel (dolerite and blue metal) from the 1870s. The mining companies constructed roads and bridges to cross the Lower Canal at the quarry. Mining operations have now ceased at the site. In 2008 Reconciliation Road (a north-south traffic artery) was constructed by the RTA and Boral and runs through the centre of the former Prospect Quarry site. Construction of this road involved excavation of the western side of Prospect Hill and necessitated the removal of a 100m section of the Lower Canal immediately west of Reconciliation Road (within the curtilage of the Prospect Reservoir SHR listing).

Approximately 1 km east of the start of the canal at Prospect Reservoir, the Lower Canal was diverted underground for 288m. This section, known as the Covered Way, was designed to protect the canal water from contamination by the slope of Prospect Hill through which it was cut. An Aboretum is located on the slope of Prospect Hill above the Covered Way (outside the Lower Prospect Canal Reserve curtilage). The original masonry Covered Way collapsed in 1904 when the canal was emptied for relining. It was rebuilt in 1905 in concrete, 308 mm thick at the floor with 256 mm thick walls and a 256 mm thick roof. The Covered Way has an oval cross-section and is 4.6m wide with a maximum water level internally of 2.6m. Its external portals each have a low concrete headwall with a pre-cast concrete block coping and the date '1905' cast into the vertical face. Three air shafts ventilated the Covered Way. These are still visible externally as short, rendered-concrete pillars with pyridamical concrete caps.

The Gipps Road overbridge (formerly the Boothtown Bridge) carries Gipps Road over the Lower Prospect Canal Reserve. The 1911 reinforced concrete arched bridge is an early example of its type, using fairly classical forms for early concrete arch design. The bridge was widened in the 1940s using three prestressed concrete girders on each side of the arch. The original bridge arch is visible from the Lower Canal's infilled pedestrian/cycleway.

East of the Gipps Road overbridge, and 3.2 km from the start of the canal at Prospect, the pedestrian cycleway passes along the top of the infilled 1883 Boothtown Aqueduct which crosses Boothtown Gully. Built by Kinchela and Metcalfe, the Boothtown Aqueduct comprises 22 brick arches each with a 30 ft (9m) span of brick with sandstone copings. Modest decorative features are incorporated into the brickwork: simple dentilation; pilasters to each arch; and string courses of round cast bricks. The side walls are secured by tie rods.

Boothtown Aqueduct is flanked at either end by the inlet and outlet valve houses of the Inverted Syphon. Constructed in 1907, the concrete Inverted Syphon by-passed the aqueduct with a culvert 3.15m in diameter, composed of reinforced concrete on concrete piers. The inlet and outlet towers are of rendered brick, decorated with cement rendered castellation and lancet arched doorways. They house the sluice gates that controlled the flow of water from the canal.

Near Percival Road, 4.6 kms from the start of the canal are the Smithfield Tanks (reservoirs), two circular concrete in-ground tanks with a capacity of 100,000 gallons constructed in 1895 to supply the Smithfield locality with water. Now disused they were infilled with sand to ground level in 2001.

After Sherwood Road, at 6.8kms from the Prospect start of the canal, are two infilled Sedimentary Chambers which removed sedimentation from the canal before it entered Pipehead. Two valves are extant at the entry to the infilled chambers where the pedestrian/cycleway diverts around the infilled chambers.

The Lower Prospect Canal Reserve terminates at Pipehead (Albert Street, Guildford) where the open Lower Canal entered the 72 inch (1829mm) pipeline that conveyed water to the Potts Hill Reservoir. The last 225m section of the Lower Canal is located within the curtilage of the SHR listed Pipehead, water supply canal and associated works (SHR No. 01629). As at 2014 this section contains the only surviving unfilled section of the Lower Canal (c. 180m).

Condition

- There is some visible movement damage and cracking in the concrete of the canal wall at the Boothtown aqueduct site in Greystanes closest to the Syphon and Valve House. The damage has been repaired but is highly visible in this area and still appears to be impacted by movement and water.
- There is evidence of graffiti along the canal wall at Greystanes.
- The Inverted Syphon is in a good condition with no evidence of damage and has been maintained.
- The Valve House is in a good condition apart from minor damage from graffiti.

Condition	Good	Fair	Poor
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Alterations and Additions

- 1895: Smithfield Tanks (reservoir) constructed for water supply for Smithfield.
- 1902-12: Relining of the canal with Monier plates or concrete to increase the capacity of the Lower Canal by around 75%.
Walls of Smithfield Tank raised.
- 1903: Sedimentation Chambers constructed west of Pipehead.
- 1905: Rebuilding of the Covered Way in concrete following its collapse.
- 1907: Boothtown Aqueduct ceases operation. Inverted Syphon constructed alongside Boothtown Aqueduct.
- 1911: Construction of Gipps Road Bridge over Lower Canal.
- 1995: Lower Canal replaced by an underground pipeline from Prospect Reservoir to Pipehead, Lower Canal decommissioned and dewatered.
- 2001: Work commenced on the Lower Prospect Canal Reserve to create a combined pedestrian/cycleway commencing at Prospect Reservoir and terminating at Pipehead Guildford. Infilling involved protection of the canal walls; installation of drainage measures and infilling with a mix of concrete aggregate and packed soil layers. An aggregate or plain pathway was constructed. The heritage significance of the canal was a consideration in this process and the infilling is reversible.
- 2003: Lower Prospect Canal Reserve and pedestrian/cycleway officially opened. Reserve gazetted as Crown Land in 2004 with then Holroyd City Council as trustees.
- 2008: A 100m section of the infilled Lower Canal on the western boundary of the Prospect Reservoir SHR listing was removed in 2008 for the construction of Reconciliation Road. The Lower Prospect Canal Reserve now commences at Reconciliation Road.

Although the structure has been now been infilled and converted into a pedestrian walkway/cycleway it has high integrity as it still retains its overall appearance and is generally intact. The infill is also

reversible and contributes to its significance. The structure retains much of its original form including the aqueduct Valve House No 1 & 2 which have been left intact. The inverted syphon also retains high integrity as it is relatively unchanged and untouched.

Integrity	High	Moderate	Low
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** element detracts from the overall cultural significance of the place*

Historical Notes

Construction years	1880-1888
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The following history is quoted from the Office of Environment and Heritage State Heritage Register's listing sheet for 'Lower Prospect Canal Reserve' (2014).

Designer/Maker: Edward Orpen Moriarty

Builder/Maker: NSW Board of Water Supply and Sewerage; Kinchela and Metcalfe

Sydney's first water supply systems

- ◆ 1788: Tank Stream
- ◆ 1830s: Busbys Bore (tunnel) constructed taking water from Lachlan Swamps (Centennial Park). Sydney's first engineered water supply system.
- ◆ 1850s: steam-pumping system drew water from Botany Swamps (Eastlakes)
- ◆ 1869: The existing system was proving inadequate and unreliable under the twin pressures of drought and Sydney's rapidly increasing population. A Royal Commission appointed by Governor Sir John Young into an adequate long-term water supply for Sydney recommended implementation of the Upper Nepean Scheme (UNS) as Sydney's fourth water supply.
- ◆ 1875: NSW Government appointed an independent expert, English civil engineer W Clark, who assessed eight potential major schemes
- ◆ 1877 Clark recommended the Upper Nepean Scheme
- ◆ 1879 NSW Government accepted Clark's recommendation
- ◆ 1880 Work began on the Upper Nepean Scheme. Edward Orpen Moriarty, Engineer in Chief for Harbours and Rivers and head of the NSW Public Works Department designed and oversaw construction of the scheme.

The Upper Nepean Scheme involved harnessing the waters of the Southern Highlands rivers (the Upper Nepean and its tributaries the Avon, Cordeaux and Cataract rivers) at Pheasants Nest Weir (near Wilton) and channelling these waters through a 65 km system of weirs, open canals, tunnels, pipes to Prospect Reservoir; via the 7.7 km long gravity-flow open canal (the Lower Canal) which included the Boothtown Aqueduct to Pipehead basin, Guildford; thence via pipeline to Potts Hill Reservoir (near Auburn) and to Crown Street Reservoir, Sydney, for reticulation and distribution.

1885: A water supply crisis hit Sydney with only 10 days water estimated to be left in the Botany Swamps. Sydney engineering firm Hudson Bros (later Clyde Engineering) provided emergency engineering works to connect the Botany Swamps to Pipehead.

1886: The Lower Canal supplied water as part of Hudson's temporary scheme which began delivering water to Sydney in January 1886. With Prospect Reservoir unfinished, a 750mm pipe was built around Prospect Reservoir to take water from the Upper Canal to the Lower Canal.

1888: Upper Nepean Scheme (including the Lower Canal), constructed by the NSW Metropolitan Water, Sewerage and Drainage Board, was completed and operational. It was an entirely gravity-fed scheme, from water harvested in the Southern Highlands to the reticulated Sydney water supply.

1902: Water level at Prospect Reservoir (Sydney's only dam) fell below gravitation level in the 'King Drought' (the most severe drought to date in NSW since European settlement). Necessitated water being pumped from the Upper Canal directly to the Lower Canal.

The Upper Nepean Scheme developed progressively from 1888, increasing its capacity in response to Sydney's growing population.

Lower Canal upgrades from 1888

1892: repairs to the 22-arched Boothtown Aqueduct constructed in 1883 to carry the Lower Canal across the Boothtown Gully. Following structural failure of the brick side of the water channel, it was reinforced with a concrete lining and tie rods.

1895: Smithfield Tanks (in-ground reservoirs) constructed to supply the Smithfield locality.

1902-12: The Lower Canal was extensively rebuilt and relined its entire length to improve stability and increase its carrying capacity from 50 to 93 million gallons (227 to 423 megalitres) per day. The water level was raised 2 ft (600mm) through lining the dry-stone masonry walls with pre-cast Monier reinforced concrete plates or in-situ cast reinforced concrete lining. To maintain supply during installation, sections of the Lower Canal were 'bulkheaded off' and a 1350mm pipe was laid along the bank to act as a temporary syphon.

1903: Sedimentation Channel and bypass were constructed west of Pipehead to remove sediment from the canal before it entered Pipehead.

1905: The Covered Way, a 288m underground section of the canal located 1 km east of the start of the Lower Canal at Prospect, collapsed in 1904 while the canal was emptied for relining. It was rebuilt in concrete in 1905.

1907: Boothtown Aqueduct ceased operation because of leaks and its insufficient capacity to carry water flow from the upgraded canal and was replaced by the concrete Inverted Syphon. Constructed in 1907, this bypassed the aqueduct for an 3m underground culvert alongside the aqueduct. At its construction the Syphon was the largest continuous concrete work of its kind constructed in Australia.

1911: Construction of reinforced concrete bridge over Lower Canal (Gipps Road Bridge) for Smithfield Road at foot of Greystanes Hill (Greystanes Road, later Gipps Road)

Additional to the Lower Canal upgrades, numerous operational and storage capacity upgrades were implemented throughout the Upper Nepean System in the first half of the 20th century. Major storage dams were constructed on the on the Southern Highlands rivers at Cataract (1907), Cordeaux (1926), Avon (1927) and Nepean (1935), which fed into the Prospect Reservoir. Additionally, nine compensation weirs were built to compensate farmers for the loss of water due to diversion of the river flow.

Increasing the storage capacity of the Upper Nepean Scheme had impacts on the Lower Canal's capacity to handle the increased water flow. Historically, the Lower Canal was the technical 'weak link' in the Upper Nepean Scheme, due to its flatness and subsequent lack of capacity. When water levels began to fall in Prospect Reservoir, water flow from the reservoir to the Lower Canal would incrementally reduce and cease when Prospect Reservoir's level fell to 20 ft (6.1m). Emergency pumping was required during the 1902 drought.

From 1927 additional pipelines were constructed to supplement the Lower Canal flow to Pipehead.

1. 1927: 54 inch (1.4m) diameter temporary woodstave pipe constructed from Upper Canal (just below Prospect) to Pipehead Basin and then on to Potts Hill Reservoir. Supplied 50 million gallons of water per day from Prospect to Pipehead.

2. 1931 work began on a permanent steel pipeline and continued in the Depression under an unemployment relief program.

3. 1937: Pipeline No. 1, a 72 inch (1.8m) diameter steel pipe was completed between Upper Canal (just above Prospect) and Pipehead. Delivered 45 million gallons per day.

4. 1938: Temporary 54 inch woodstave pipe at Pipehead was shut down and dismantled. It remained in operation, however, between Prospect and Pipehead alongside the new steel main until it was decommissioned in 1950s.

5. The Lower Canal's capacity was further supplemented by the construction of Pipeline No. 2, an 84 inch (2.1m) diameter cement-lined steel pipe between Prospect and Pipehead, adjacent to the earlier 72 inch pipeline, which delivered a further 90 million gallons per day.

6. 1958: Warragamba Dam (completed 1960) quadrupled the water storage capacity of all the four Southern Highlands dams and progressively supplied Prospect Reservoir.

1960 Chlorination of Sydney's water supplies began. Facilities introduced at Prospect and Potts Hill.

By the late 1980s, the Lower Canal was unable to keep up with the increasing demand for water from Sydney's grown population. At its peak capacity, following modifications, it could still carry only 100 million gallons per day compared to the 150 million gallon capacity of the Upper Canal to Prospect section of the scheme. In addition, increasing standards of water quality and security of supply were coming up against the urban development that was encroaching on the setting of the open water Lower Canal.

In the 1990s plans were adopted to bypass the Prospect Reservoir and the Lower Canal with water delivered directly from the Upper Canal and Warragamba pipelines to the screening chambers at Pipehead. The Upper Canal and the mains from Warragamba Dam were connected to a new water treatment plant on the west side of Prospect Reservoir which connected to the existing 1937 (72 inch) and 1958 (84 inch) pipelines to Pipehead.

In 1995 work on the Prospect Reservoir and Lower Canal diversion was completed. The Lower Canal's function was replaced by a 3m diameter concrete-lined steel pipe, encased in a tunnel, running below ground from Prospect to Pipehead. This greatly increased the reliability, water quality and level of water flow from Prospect to Pipehead. The Lower Canal was decommissioned and drained. The Prospect Reservoir became a storage (rather than a service) reservoir, providing back up water supply to compensate for demand fluctuations or supply failure.

Listing follows more than 20 years campaigning to save the 64 hectare site. Parts of the canal, including the Boothtown Aqueduct, were already-heritage listed, but the reserve as a whole was not until 2015. The Canal Reserve Action Group (CRAG) spent eight years lobbying for heritage listing for the reserve, with many meetings with interested parties, research and submissions. In 1995 the state government considered selling a major piece of the Canal Reserve for medium-density housing. Residents rallied against this, resulting in the formation of CRAG. The group led a community campaign for the creation of the Lower Prospect Canal Reserve, which became a public reserve in 2004. CRAG is regarded as a guardian of the reserve (Stevens, 2015, 6).

Recommendations					
Heritage Management		Existing Built and Landscape Elements		Future Development and Planning	
1. Maintain this item's heritage listing on the LEP.	X	6. Original fabric is highly significant and should be maintained.	X	12. Alterations and additions should respond to the existing pattern of development, with careful consideration of the setting (form, scale, bulk, setback and height).	X

2. Maintain this item's listing as part of the Heritage Conservation Area.		7. Unsympathetic alterations that detract from the cultural significance of the item should be removed.		13. New alterations and additions should respect the historic aesthetic/character of the item and area (e.g. paint scheme, materiality, style, landscape elements).	X
3. Consider delisting as an individual item from the LEP.		8. Maintain heritage landscape elements and schemes.	X	14. Future uses for this item should be compatible with its historical functions/associations.	X
4. Consider additional research to nominate this item for the State Heritage Register.		9. Maintain the existing setting of the heritage item, informed by the historic pattern of neighbouring development (form, scale, bulk, setback and height).	X		
5. The heritage curtilage for this item should be revised/reduced.		10. Maintain the historic aesthetic/character of the item and area (e.g. paint scheme, materiality, style, landscape elements).	X		
		11. The condition of this item is poor. Condition and maintenance should be monitored.			

Other recommendations and/or comments:

- Note that the heritage curtilage of former items A2; I52; I29 (Holroyd) has been revised to reflect the State Heritage Register listing for 01945 'Lower Prospect Canal Reserve'. The above curtilage map reflects this revised curtilage. The above curtilage map reflects this revised curtilage and should be integrated into the Cumberland LEP.

Listings

Heritage Listing	Listing Title	Listing Number
Heritage Act – State Heritage Register	Lower Prospect Canal Reserve	01945
Local Environmental Plan	<ul style="list-style-type: none"> Lower Prospect Canal Reserve; "Boothtown Aqueduct"; Footbridge over Lower Prospect Canal; and "Boothtown Aqueduct" (previously Greystanes Aqueduct), Aqueduct Valve House No 1, Aqueduct Valve House No 2, Culvert No 1 under Aqueduct, Culvert No 2 under Aqueduct, Lower Prospect Canal Reserve and garden 	I01945
Heritage Study	<ul style="list-style-type: none"> Lower Prospect Canal Reserve; "Boothtown Aqueduct"; Footbridge over Lower Prospect Canal; and "Boothtown Aqueduct" (previously Greystanes Aqueduct), Aqueduct 	I01945

	Valve House No 1, Aqueduct Valve House No 2, Culvert No 1 under Aqueduct, Culvert No 2 under Aqueduct, Lower Prospect Canal Reserve and garden	
National Trust Australia Register	<ol style="list-style-type: none"> 1. Sydney Water Supply: Lower Canal Group; Greystanes Aqueduct 2. Aqueduct: Part Lower Canal Group; Sydney Water Supply: Lower Canal Group 	No ID number

Previous Studies

Type	Author	Year	Title
Heritage Study	Extent Heritage Pty Ltd	2019	Cumberland LGA Heritage Study
Heritage Study	Neustein & Associates	1992	Holroyd Heritage
Heritage Study	E Higginbotham, T Kass, V Murphy, J Collocott, T Fiander, S Lavelle	1992	Heritage Study Upper Canal, Prospect Reservoir, Lower Canal (Upper Nepean Scheme) Vols 1, 2 & 3
Archival Recording and SOHI	E. Higginbotham	2000	Archival Record & SOHI, Lower Canal, Prospect to Pipehead (Part of Upper Nepean Scheme) Vol 1 History, Description & Statement of Significance
Conservation Management Strategy	Futurepast Heritage Consulting	2012	Lower Canal at Pipehead: Conservation Management Strategy

Other References

- Breen, J 2014. Submission on the Lower Prospect Canal Reserve proposed SHR listing
- Broomham, R and T Kass. 1992. Holroyd Heritage Study Thematic History. Sydney: Holroyd City Council.
- Office of Environment and Heritage 2014. SHR Listing Sheet for Lower Prospect Canal Reserve, accessed 14 June 2019, <https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5055898>

Limitations

1. Access to all heritage items was limited to a visual inspection from the public domain. The interiors of buildings and inaccessible areas such as rear gardens were not assessed as part of this heritage study.
2. Condition and site modification assessment was limited to a visual inspection undertaken from the public domain.
3. Unless additional research was required, historical research for all heritage items was based on an assessment of previous LGA heritage studies, the Thematic History (prepared by Extent Heritage, 2019) and existing information in former heritage listing sheets.

Additional Images



View towards landscape surrounding Boothtown aqueduct and Aqueduct Valve House No. 1 and No. 2.



View along the Boothtown Aqueduct showing the Boothtown Syphon in the background.



Boothtown Syphon.



The Boothtown Aqueduct.



View to cracking of wall at Boothtown Aqueduct.



View to footbridge over the Lower Prospect Canal.