Heritage Inventory Sheet

Item Name	Parramatta Road Milestone		
Recommended Name	Parramatta Road Milestones Group		
Site Image			
Address	Parramatta Road, between Dartbrook Road and Station Street, Auburn NSW 2144; and Parramatta Road, between Platform Street and Delhi Street, Lidcombe NSW 2144.		
Lot/Section/DP	-	-	-
Draft Cumberland LEP ID	I295		
Former LEP ID	A51 (Auburn LEP) Parramatta Road Milestone; and A52 (Auburn LEP) Parramatta Road Milestone.		
Heritage Conservation Area	Not included		
Date Updated	March 2020		
Significance Level	LOCAL		
Site Type	Level 1	Built	
	Level 2	Exploration, Survey and Events	

Curtilage Map

Note: Former item number used to identify individual milestones.

Revised curtilage recommended – refer below

Statement of Significance

The Parramatta Road Milestones Group are of local significance for their historic, associative, aesthetic and representative heritage values. The milestones are historically significant in their role of marking the distance of the journey along Parramatta Road from Parramatta to Sydney. They are a tangible reminder of the continuing importance of Parramatta Road as a main highway between Sydney, Parramatta and the West. While some milestones are no longer located in their exact original location, they relate to their original location and mark the significance of Parramatta Road and the construction of roads by the Department of Main Roads. The milestones are associated with the Department of Main Roads in 1934 and their implementation of the "Type D" milestones for use in urban situations. The milestones have aesthetic significance through their notable lettering and form, and their role as a landscape element. The milestones as a pair are good representative examples of concrete and milestones in the 'Type D' style adopted by the Department of Main Roads in 1934.

Criteria Assessment	
a) Historic	The Parramatta Road Milestone Group consists of two concrete milestones. This concrete milestone style was first adopted by the Department of Main Roads in 1934 and was known as "Type D" for use in urban situations. They are a tangible reminder of the continuing importance of Parramatta Road as a main highway between Sydney, Parramatta and the West. While many milestones are no longer located in their exact original location, they relate to their original location and mark the significance of Parramatta Road and the construction of roads by the Department of Main Roads.
b) Associative	The items are associated with the Department of Main Roads in 1934 and their implementation of the "Type D" milestones for use in urban situations.
c) Aesthetic/Technical	The milestones have aesthetic significance through their notable lettering and form, and their role as a landscape element.
d) Social	The item does not meet this criterion.
e) Scientific	The item does not meet this criterion.
f) Rarity	The item does not meet this criterion.
g) Representativeness	They are good representative examples of concrete milestones in the 'Type D' style adopted by the Department of Main Roads in 1934.

Physical Description

Item 1 (Parramatta Road, between Station Road and Dartbrook Road)
Description
Milestone, precast concrete post, four sided, white painted with lettering in black paint stating 'S12' on one side and 'PITTA 3' on another side. Placed at kerb of roadway.

Location
It is unclear if this milestone is in its original location.

Condition
Fair condition overall. White paint almost completely faded or flaked off.

Item 2 (Parramatta Road, between Platform Street and Delhi Street)
Description
Milestone, precast concrete post, four sided, white painted with lettering in black paint, 'S11' on one side and 'PITTA 4' on another side. Placed at kerb of roadway.

Location
It is unclear if this milestone is in its original location.

Condition
Fair condition overall. White paint almost completely faded or flaked off. Now set in concrete slab.

Condition	Good	**Fair**	Poor

Alterations and Additions

- Damage from vehicular traffic.
- Chip in the top Item 1
- Potential relocation.

Although the milestones have been damaged, on the most part they have high integrity in both form and detailing. It is unclear if they have been relocated in the past.

Integrity	**High**	Moderate	Low

** element detracts from the overall cultural significance of the place*

Historical Notes

Construction years	1934

Parramatta Road Milestones
Parramatta Road was a major thoroughfare for the colony, with a constant stream of people and goods passing back and forth. Soon, hotels for travellers and settlements around various nodal points – such as brickworks and timberyards – began to develop. By 1822, it was reported that Parramatta Road was 15 miles long with 37 bridges along its length, and stagecoach services had taken over from river transport as the main means of travel between the two settlements. Coaches ran until the railway took away their clientele.

Parramatta Road began to suffer neglect as goods and people were increasingly moved by rail, from the 1850s onwards. This situation lasted until the 1920s, when the growing prevalence of motor transport necessitated major repairs and ongoing maintenance for the road. The poor state of Parramatta Road was a major issue for many years and inspired the formation of an organisation to promote the needs of motorists which later became the NRMA. It also caused the establishment of the Department of Main Roads. The earliest works undertaken by the Main Roads Board, soon to be renamed the Department of Main Roads focussed upon Parramatta Road. In 1927-8, for example, it expended over £50,000 in concreting the Parramatta Road in Auburn and Lidcombe and built concrete bridges at "Meatworks Creek", Lidcombe, a culvert at Francis Street and widened the Chemical Works Bridge across Duck Creek in Auburn. Work continued in following years. By 1930, most of Parramatta Road through the municipalities of Auburn and Lidcombe had been paved with cement concrete, and the bend in the road at Haslams Creek had been straightened and a new reinforced concrete bridge had replaced the timber structure across the Creek.

The augmentation of railway travel and the replacement of horse drawn transport was a process which had a decided impact upon the area. As the use of motor cars had increased in number by 1910s, this saw the introduced the tarring and concreted roads to better handle the heavier loads. Several roads were also widened and had the roadside kerb redone.'

Concrete Milestones
The concrete milestone style was first adopted by the Department of Main Roads in 1934 and was known as "Type D" for use in urban situations. In earlier forms, the use of painting without incising numbers on concrete mileposts was initially favoured as it allowed for alterations being readily made from time to time as became necessary owing to deviations or alterations of a route.

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).	
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.		**14.** Future uses for this item should be compatible with its historical functions/ associations.	
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).			
5. The heritage curtilage for this item should be revised/reduced.	**X**	**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:

- As the milestones are best identified as a group, they should be given one LEP ID number on the Cumberland LEP.
- This item has been converted from an Archaeological Item to a Heritage Item. The former LEP has classified a series of items of an industrial nature, including railway, road and water infrastructure, as 'archaeological' sites. This classification is historical and relates to the former use of the term 'Industrial Archaeology', which refers to the study of industrial and engineering history. The use of the term 'Industrial Archaeology' is no longer used and the term 'Industrial Heritage' is now preferred. Archaeological sites are legally defined as sites which contain one or more 'relics' and, in NSW, relics are specifically protected by the Sections 138 -146 of the Heritage Act 1977. The classification of a site as 'archaeological' consequently affects the statutory controls and procedures, including the need for excavation permits and pre-excavation procedures, triggered by Development Applications.
  This is consistent with the listing of other milestones within the Cumberland LGA, in particular the Woodville Road Milestones Group (Item #I296) and Great Western Highway Milestones Group (Item #I297).
- The items should not be removed from their current locations.
- It is recommended that the curtilage be revised to ensure each milestone has a curtilage of a one-metre radius around the marker. Due to the distance between each milestone, a revised curtilage

map has not been provided as it will not accurately reflect this revised curtilage. Should the revised curtilage be adopted, this listing sheet does not reflect the current Lot/DP which will need to be altered.

Listings		
Heritage Listing	Listing Title	Listing Number
Heritage Act – State Heritage Register	N/A	-
Local Environmental Plan	Parramatta Road Milestones Group	I296
Heritage Study	Parramatta Road Milestones Group	I296
National Trust Australia Register	Milestone Group	-

Previous Studies			
Type	Author	Year	Title
Heritage Study	Extent Heritage Pty Ltd	2019	Cumberland LGA Heritage Study
Heritage Review	DPC	2007	Auburn Town Centre Heritage Review
Heritage Study	Neustein & Associates	1996	Auburn Heritage Study
Heritage Study	Terry Kass	1995	Draft Historical Context Report: Auburn Heritage Study

Other References

- Department of Main Roads. 1950. *Milestones and Milestones*, Main Roads Journal, Vol. 15, No. 4, pp. 127-131.
- Department of Main Roads. 1934. *The Mileposting of Main Roads*, Main Roads Journal, Vol. 5, No. 3.
- Department of Public Works and Services. 1999. *Sydney Region Heritage Milestones*.
- Crofts, R. and Crofts, S. 2013. *Discovering Australia's Historical Milemarkers and Boundary Stones*. Libraries Australia: Gordon, NSW.

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

Auburn Item 1 (Parramatta Road between Station Road and Dartbrook Road).

Auburn Item 1 (Parramatta Road between Station Road and Dartbrook Road).

Auburn Item 1 (Parramatta Road between Station Road and Dartbrook Road).

Auburn Item 1 (Parramatta Road between Station Road and Dartbrook Road).

Auburn Item 2 (Parramatta Road, between Platform Street and Delhi Street).

Auburn Item 2 (Parramatta Road, between Platform Street and Delhi Street).

 Auburn Item 2 (Parramatta Road, between Platform Street and Delhi Street).	 Auburn Item 2 (Parramatta Road, between Platform Street and Delhi Street).

Heritage Inventory Sheet

Item Name	Milestone		
Recommended Name	Woodville Road Milestones Group		
Site Image			
Address	Woodville Road, between Claremont Street and Pattern Avenue, Guildford NSW 2161; and Woodville Road, between Guildford Road and Rhodes Avenue, Merrylands NSW 2160.		
Lot/Section/DP	-	-	-
Draft Cumberland LEP ID	I296		
Former LEP ID	I650 (Parramatta LEP), Milestone; and I651 (Parramatta LEP), Milestone		
Heritage Conservation Area	Not included		
Date Updated	March 2020		
Significance Level	LOCAL		
Site Type	Level 1	Built	

	Level 2	Exploration, Survey and Events

Curtilage Map

Note: Former item number used to identify milestones.

Revised curtilage recommended - refer below.

Statement of Significance

The Woodville Road Milestones Group are of local significance for their historic, associative, aesthetic, rarity and representative heritage values. The milestones are historically significant in their role of marking out the four-mile journey along Woodville Road from Liverpool to Parramatta. They are good examples of the use of concrete for milestones in the 1930s and are associated with the Department of Main Roads their implementation of the "Type D" milestones for use in urban situations. They are a tangible reminder of the use of road markers, originally established by Governor Macquarie across the Cumberland Plain. The milestones have aesthetic significance through their notable lettering and form, and their role as a landscape element. They are the last two remaining of four milestones along Woodville Road. The milestones as a pair, and consideration with other milestones in the rest of Sydney, are rare.

Criteria Assessment	
a) Historic	The milestones are historically significant in their role of marking out the four-mile journey along Woodville Road from Liverpool to Parramatta. They are a tangible reminder of the use of road markers, originally established by Governor Macquarie across the Cumberland Plain.
b) Associative	The items are associated with the Department of Main Roads in 1934 and their implementation of the "Type D" milestones for use in urban situations.
c) Aesthetic/Technical	The milestones have aesthetic significance through their notable lettering and form, and their role as a landscape element.
d) Social	The item does not meet this criterion.
e) Scientific	The item does not meet this criterion.
f) Rarity	Previously forming a group of four, they are now the last two remaining milestones along Woodville Road.

g) Representativeness	They are good examples of the use of concrete for milestones in the 1930s.

Physical Description

The two remaining concrete milestones on Woodville Road link Liverpool to Parramatta. Originally, there were four, though PTTA 1 and PTTA 4 have been removed. The milestones are placed on the western side of the road.

MERRYLANDS: Item 1 (Woodville Road, between Claremont Street and Patten Avenue)
Description
Milestone, precast concrete post, four sided, white painted with lettering in black paint stating 'L8' on one side and 'PTTA 2' on another side. Placed at kerb of roadway and set into a concrete footing.

Location: Likely in original location.

Condition: Good condition overall. White paint flaking off in some areas.

GUILDFORD: Item 2 (Woodville Road, between Rhodes Avenue and Guildford Road)
Description
Milestone, precast concrete post, four sided, white painted with lettering in black paint stating 'L7' on one side and 'PTTA 3' on another side. Placed at kerb of roadway.

Location: Likely in original location.

Condition: Good condition overall. White paint flaking off in some areas.

Condition	**Good**	Fair	Poor

Alterations and Additions

- Minor damage from vehicular traffic
- Potential relocation, although likely in original location
- White paint flaking off both milestones

Although the milestones have been damaged, they have high integrity in both form and detailing. It is unclear if they have been relocated in the past.

Integrity	**High**	Moderate	Low

** element detracts from the overall cultural significance of the place*

Historical Notes

Construction years	1934

Concrete Milestones
The concrete milestone style was first adopted by the Department of Main Roads in 1934 and was known as "Type D" for use in urban situations. In earlier forms, the use of painting without incising numbers on concrete mileposts was initially favoured as it allowed for alterations being readily made from time to time as became necessary owing to deviations or alterations of a route.

Woodville Road Milestones
The concrete milestones on Woodville Road linked Liverpool to Parramatta. These milestones were used by stage coaches travelling from Sydney along Liverpool Road, before they turned right towards Parramatta. Due to the positioning of the milestones, they would always be on the driver's left hand side. Originally there were four milestones along Woodville Road, marking the four mile journey. These were marked as PTTA 1, PTTA 2, PTTA 3 and PTTA 4. Today, only PTTA 2 and PTTA 3 remain.

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).	
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.		**14.** Future uses for this item should be compatible with its historical functions/ associations.	
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).			
5. The heritage curtilage for this item should be revised/reduced.	**X**	**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:

- As the milestones are best identified as a pair, they should be given one LEP ID number on the Cumberland LEP.
- The items should not be removed from their current locations.
- It is recommended that the curtilage be revised to ensure each milestone has a curtilage of a one-metre radius around the marker. Due to the distance between each milestone, a revised curtilage map has not been provided as it will not accurately reflect this revised curtilage. Should the revised curtilage be adopted, this listing sheet does not reflect the current Lot/DP which will need to be altered.

Listings		
Heritage Listing	Listing Title	Listing Number
Heritage Act – State Heritage Register	N/A	-
Local Environmental Plan	Milestone	I297
Heritage Study	Milestone	I297
National Trust Australia Register	N/A	-

Previous Studies			
Type	Author	Year	Title
Heritage Study	Extent Heritage Pty Ltd	2019	Cumberland LGA Heritage Study
Parramatta Heritage Review	National Trust (Parramatta Branch)	2004	Parramatta Heritage Review
Parramatta Heritage Review	Meredith Walker	1993	City of Parramatta Heritage Study

Other References

- Department of Main Roads. 1950. *Milestones and Milestones*, Main Roads Journal, Vol. 15, No. 4, pp. 127-131.
- Department of Main Roads. 1934. *The Mileposting of Main Roads*, Main Roads Journal, Vol. 5, No. 3.
- Department of Public Works and Services. 1999. *Sydney Region Heritage Milestones*.
- Macdonald, W.A. 1940. *Old Milestones: Parramatta Road*, Journal of the Royal Historical Society, Vol. 26, Part 4.
- Crofts, R. and Crofts, S. 2013. *Discovering Australia's Historical Milemarkers and Boundary Stones*. Libraries Australia: Gordon, NSW.

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

Merrylands Item 1 (Woodville Road, between Claremont Street and Patten Avenue).

Merrylands Item 1 (Woodville Road, between Claremont Street and Patten Avenue).

Guildford Item 2 (Woodville Road, between Rhodes Avenue and Guildford Road).

Guildford Item 2 (Woodville Road, between Rhodes Avenue and Guildford Road).

Guildford Item 2 (Woodville Road, between Rhodes Avenue and Guildford Road).

Guildford Item 2 (Woodville Road, between Rhodes Avenue and Guildford Road).

Heritage Inventory Sheet

Item Name	Milestone group, Parramatta to Greystanes		
Recommended Name	Great Western Highway Milestones Group		
Site Image			
Address	Great Western Highway, west of Bridge Road, Greystanes; Great Western Highway, between Cumberland Highway and Jewelsford Road, Wentworthville; and Great Western Highway, west of Targo Road, Pendle Hill.		
Lot/Section/DP	-	-	-
Draft Cumberland LEP ID	I297		
Former LEP ID	I26 (Holroyd LEP),		
Heritage Conservation Area	Not included		
Date Updated	March 2020		
Significance Level	LOCAL		
Site Type	Level 1	Built	
	Level 2	Exploration, Survey and Events	

Curtilage Map

Revised curtilage recommended - refer below

Statement of Significance

The Great Western Highway Milestones Group are of local significance for their historic, associative, aesthetic, rarity and representative heritage values. The milestone group has historic significance as they consist of three of the earliest milestones provided in sandstone and dating to 1816. They form part of a group of 16 milestone markers which indicate the mileage from Sydney along the Great Western Highway from Parramatta to Penrith.

The milestones are a tangible reminder of the network of toll roads established by Governor Macquarie across the Cumberland Plain, and the continuing importance of the Great Western Road (now Great Western Highway) first as a turnpike or toll road and later as a main highway between Sydney, Parramatta and the West. The milestones are also associated with Edward Cureton who was paid to make 54 milestones for the Great Western Road to Penrith and who originally surveyed and constructed Great Western Highway.

The milestones have aesthetic significance through their notable lettering and form, and their role as a landscape element. The item as a group, in consideration with other milestones in the rest of Sydney, are rare and representative of some of the earliest sandstone milestones.

Criteria Assessment	
a) Historic	The milestone group has historic significance as they consist of three of the earliest milestones provided in sandstone and dating to 1816. They form part of a group of 16 milestone markers which indicate the mileage from Sydney along the Great Western Highway from Parramatta to Penrith.

b) Associative	The milestones are a tangible reminder of the network of toll roads established by Governor Macquarie across the Cumberland Plain, and the continuing importance of the Great Western Road (now Great Western Highway) first as a turnpike or toll road and later as a main highway between Sydney, Parramatta and the West. The milestones are also associated with Edward Cureton who was paid to make 54 milestones for the Great Western Road to Penrith and who originally surveyed and constructed Great Western Highway.
c) Aesthetic/Technical	The milestones have aesthetic significance through their notable lettering and form, and their role as a landscape element.
d) Social	The item does not meet this criterion.
e) Scientific	The item does not meet this criterion.
f) Rarity	The milestones are rare as a group, in consideration with other milestones in the rest of Sydney.
g) Representativeness	They are good representative examples of some of the earliest sandstone milestones.

Physical Description

GREYSTANES

Item 1 (Great Western Highway, west of Bridge Road)
Description
Milestone, sandstone, four sided, with engraved lettering stating 'SYDNEY XVI' on one side and 'PENRITH XVII' on the other side. Placed several metres in from the road.

Size: 15" x 17" x 33"

Location
Relocated according to the National Trust NSW listing sheet (Appended below)

Condition
Fair condition overall. Some impact damage on the sides of the milestone. The 'SYDNEY XVII' face appears to have been recreated recently.

Item 2 (Great Western Highway, between Cumberland Highway and Jewelsford Road)
Description
Milestone, sandstone, four sided, with engraved lettering stating 'SYDNEY XVII' on one side and 'PENRITH XVI' on the other side. Placed several metres in from the road,diagonal from the road and set into a concrete footing.

Size: 15" x 17" x 35"

Location
Likely to be in its original location.

Condition
Fair condition overall. Lichen on top of monument. Some impact damage on the sides of the milestone.

Item 3 (Great Western Highway, west of Targo Road)
Description
Milestone, sandstone, four sided with chamfered tops, with engraved lettering stating 'SYDNEY XVIII' on one side and 'PENRITH XV' on the other side. Placed several metres in from the road and set into a concrete footing.

Size: 16" x 17" x 22"

Location
In original location.

Condition
Poor condition overall. Lichen on top of monument. Some impact damage on the sides of the milestone. Delaminating of sandstone to 'SYDNEY XVIII' side.

Refer below for appended National Trust Listing Sheet for Great Western Highway Milestones with exact locations of Milestones.

Condition	Good	**Fair**	Poor

Alterations and Additions

- Damage from vehicular traffic
- Potential relocation

Although the milestones have been damaged, on the most part they have high integrity in both form and detailing. It is unclear if they have been relocated in the past.

Integrity	**High**	Moderate	Low

** element detracts from the overall cultural significance of the place*

Historical Notes

Construction years	1816

Lachlan Macquarie, upon his arrival to the colony and appointment as Governor in 1810, embarked on a programme of civic improvements. In addition to the construction of public works, he also placed considerable emphasis on roadworks. In which, many of the former roads and bridges had become almost impassable, it was Governor Macquarie who sought to introduce planning to their construction and regulation of their use. This was financed by a system of tolls and revenue obtained being devoted to road maintenance by convict labour. Surviving along the Great Western Highway are a number of stone milestones that reflect Macquarie's era of road improvements.

The Great Western Road
The construction of the Great Western Road (now The Great Western Highway) commenced in 1814 and was finished by 1818. The builder of the road was William Cox who had also built the road over the Blue Mountains. The Great Western Road milestones were commissioned in 1814 from Edward Cureton who was paid to make 54 milestones for the great Western road to Penrith.

Sandstone Mile Markers
The use of mile markers on the Colony's roads was first implemented as part of Governor Macquarie's program of infrastructure upgrade and is tied in with the creation of turnpike roads and road improvements generally. The credit for making the first milestones in the Colony belongs to Edward Cureton. In the Police Fund Quarterly Account, ending 30th September 1814 stands the entry, "Edward Cureton for 54 milestones. £40.10s.0d".

By 1816 milestones had been laid along the Parramatta, Liverpool and South Head Roads. However, local vandals regularly defaced the Roman numerals such that a public notice in the Sydney Gazette dated 26th October 1816 published a warning of prosecution for anyone breaking, defacing or injuring any of the milestones along the "New Roads" that radiated from Sydney.

The three sandstone milestones included in this listing are part of a group of 16 milestone markers which indicate the mileage from Sydney along the Great Western Highway from Parramatta to Penrith. They are located at intervals along the southern side of the highway.

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).	
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.		**14.** Future uses for this item should be compatible with its historical functions/ associations.	
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).			
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:

- As the milestones are best identified as a group, they should be given one LEP ID number on the Cumberland LEP.
- Several milestones require conservation or maintenance works, in particular Item 3 (Great Western Highway, west of Targo Road) in Greystanes which is in poor condition and has lichen growth on top and damage from road traffic.
- The items should not be removed from their current locations.
- It is recommended that the curtilage be revised to ensure each milestone has a curtilage of a one-metre radius around the marker. Due to the distance between each milestone, a revised curtilage map has not been provided as it will not accurately reflect this revised curtilage. Should the revised curtilage be adopted, this listing sheet does not reflect the current Lot/DP which will need to be altered.

Listings		
Heritage Listing	Listing Title	Listing Number
Heritage Act – State Heritage Register	N/A	-
Local Environmental Plan	Milestones Group, Parramatta to Greystanes	I298
Heritage Study	Milestones Group, Parramatta to Greystanes	I298
National Trust Australia Register	Great Western Highway Milestone Group	No ID number

Previous Studies			
Type	Author	Year	Title
Heritage Study	Extent Heritage Pty Ltd	2019	Cumberland LGA Heritage Study
Heritage Study	Graham Brooks & Associates	1998	Holroyd Heritage inventory Review
Heritage Study	Neustein & Associates	1992	Holroyd Heritage Study

Other References

- Crofts, R. and Crofts, S. 2013. *Discovering Australia's Historical Milemarkers and Boundary Stones*. Libraries Australia: Gordon, NSW.
- Department of Main Roads. 1950. *Milestones and Milestones*, Main Roads Journal, Vol. 15, No. 4, pp. 127-131.
- Department of Main Roads. 1934. *The Mileposting of Main Roads*, Main Roads Journal, Vol. 5, No. 3.
- Department of Public Works and Services. 1999. *Sydney Region Heritage Milestones*.
- Macdonald, W.A. 1940. *Old Milestones: Parramatta Road*, Journal of the Royal Historical Society, Vol. 26, Part 4.
- National Trust of Australia (N.S.W) 1987. Listing Proposal for *Great Western Highway Milestone Group.*

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

Greystanes Item 1 (Great Western Highway, west of Bridge Road).

Greystanes Item 1 (Great Western Highway, west of Bridge Road).

Greystanes Item 1 (Great Western Highway, west of Bridge Road).

Greystanes Item 1 (Great Western Highway, west of Bridge Road).

Greystanes Item 2 (Great Western Highway, between Cumberland Highway and Jewelsford Road).

Greystanes Item 2 (Great Western Highway, between Cumberland Highway and Jewelsford Road).

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Greystanes Item 3 (Great Western Highway, west of Targo Road).

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Greystanes Item 3 (Great Western Highway, west of Targo Road).

NATIONAL TRUST LISTING SHEET

PARRAMATTA (TO PENRITH) (Town or District)	GREAT WESTERN HIGHWAY MILESTONE GROUP (SET of 16, PARRAMATTA TO PENRITH)	Gt. Western Highway, between Parramatta and Penrith (See below, and attached sketch plans.)
Post Code Parramatta, Holroyd Local Govt Area Blacktown, Penrith		
Author of Proposal N. Parker A. Wulf		
Date of Proposal 3 January 1987	(Name or Identification of Listing)	(Address or Location)
Suggested Listing Category Classification	Bibliography: Drawings & locations supplied by N. Parker, Consultant to DMR H.R.A. 1 Vol 10 pp542-4 & 696-7 Australian Encyclopaedia, published Grolier, Sydney 1967.	Owner and Address: Department of Main Roads 309 Castlereagh Street, SYDNEY NSW 2000
Committee (Trust Use) IAC		
Council (Trust Use) APPROVED CL 16.3.87		

S 9003

Description — Briefly cover the points on the following check list where they are relevant and within your knowledge.

Style, Construction, Use, Architect/s, Builder/s, Date of Construction, Present Condition, History, Owners, Boundaries of proposed listing

Sixteen sandstone mile markers indicate the mileage from Sydney along the Great Western Highway from Parramatta to Penrith. They are located at intervals along the southern side of the highway.
The standard design of these milestones has a square plan, trapezoidal section (tapering to the top), 75cm high, 42cm square at the base and 37cm square at the champhered top. They are unpainted and are set diagonally to the road with inscription on two adjacent sides. The exceptions are milestone 1 at Parramatta (Penrith XVIII, sydney XV) which is set square to the road with inscription on opposite sides, and milstone 4 at Greystanes (Penrith XV, Sydney XVIII) which features a squared top. A number have been relocated and/or set in new concrete bases. Allowing for accidents and resetting they are of essentially similar design.
This section of road was constructed after Cox's road over the Blue Mountains. Gov. Macquarie listed this road as one of his achievements. Major Druitt supervised its construction.
Boundary/Curtilage: Classification to cover the fabric of the milestones and location in situ only.

Reasons for listing

These milestones mark the line of road between Parramatta and Penrith originally surveyed and constructed under the Governorship of Lachlan Macquarie.

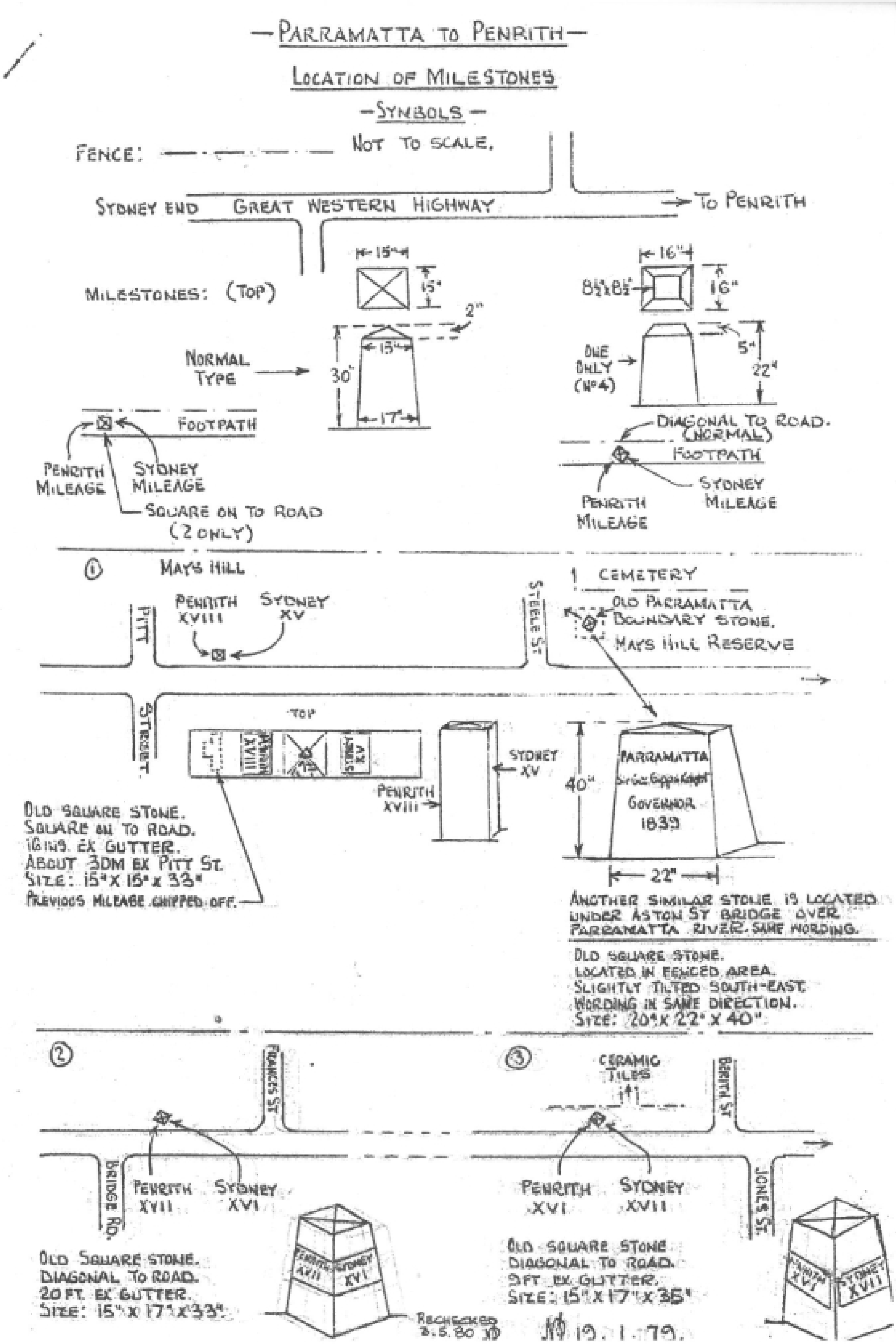
Owner & LGA notified, form letter IAC/2a, 22 & 24/4/87 SC

~~Sketch plan and photos~~ ~~Rough additional photos if any~~

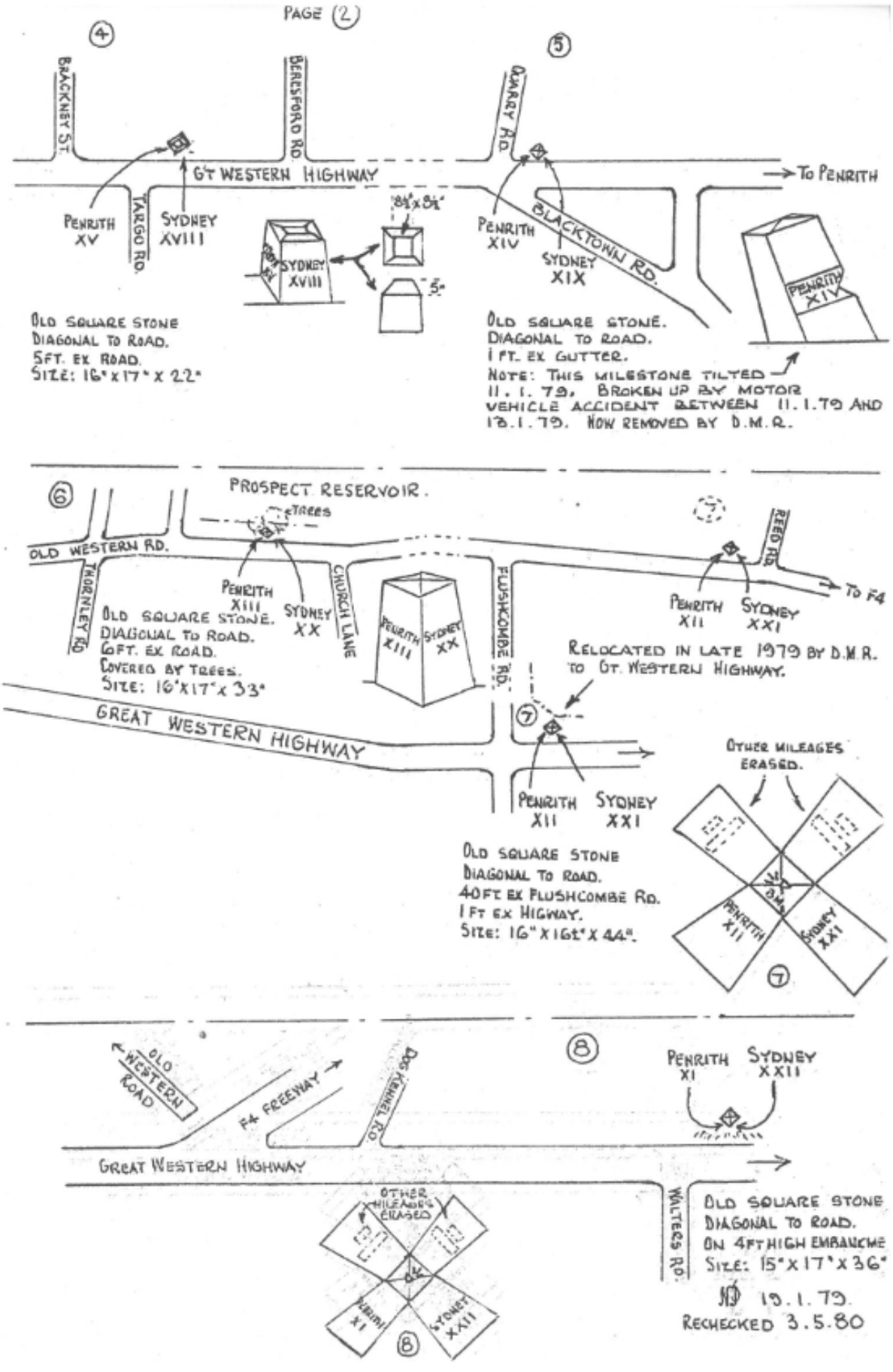
Locations: All or these milestones except number 6, are located on the southern side of the Great Western Highway. A reference to the nearest cross street for each is given below

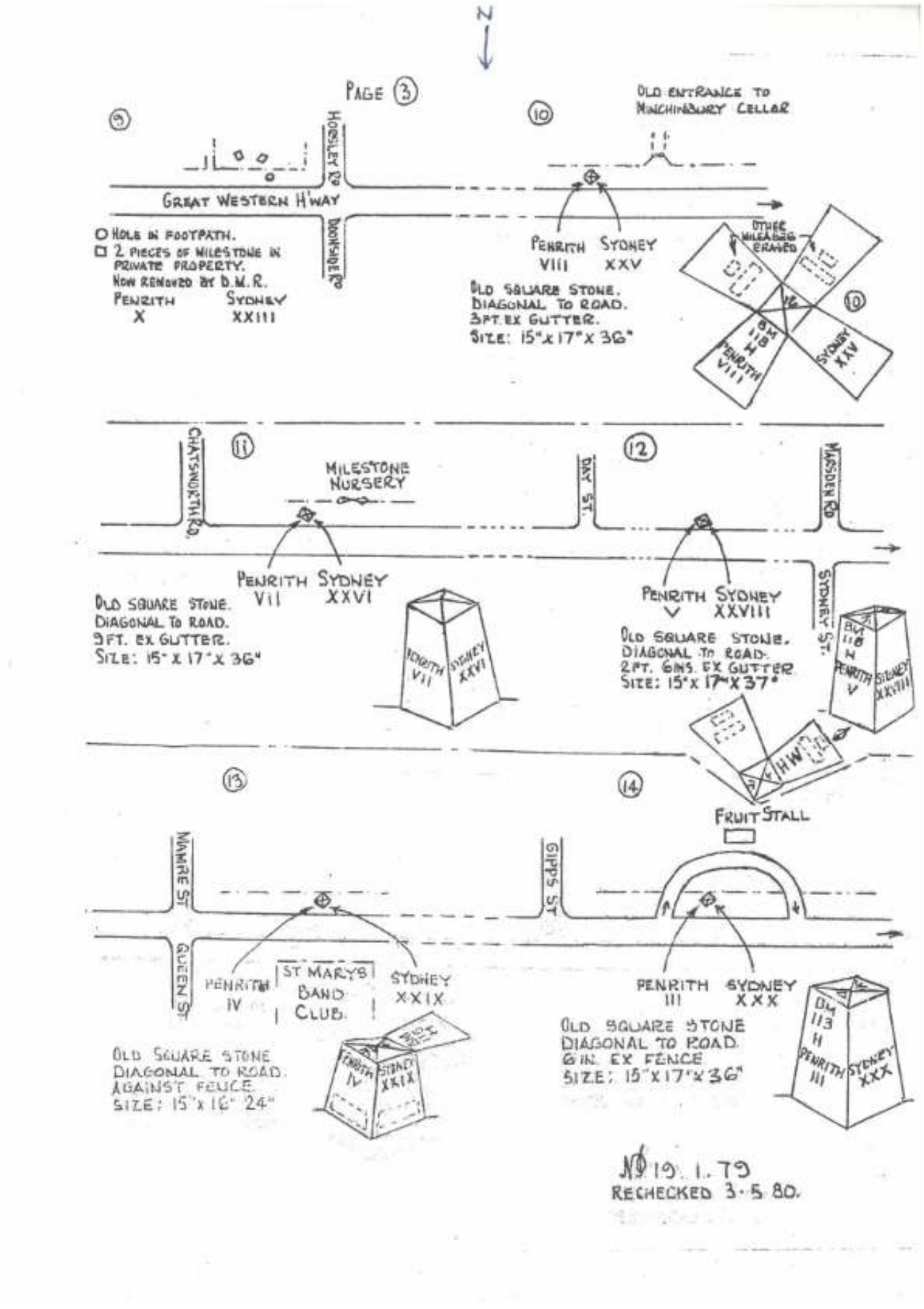
1. Parramatta, west of Pitt Street (Penrith XVIII, Sydney XV) .
2. Wentworthville, east of Francis Street (Penrith XVII, Sydney XVI) relocated.
3. Greystanes, east of Berith Street (Penrith XVI, Sydney XVII).
4. Greystanes, east of Beresford Road (Penrith XV, Sydney XVIII).
5. Prospect, east corner Quarry Road (Penrith XIV, Sydney XIX).
6. Prospect, Old Western Road, east of Church Lane (Penrith XIII, Sydney XX) .
7. Prospect, east of Flushcombe Road (Penrith XII, Sydney XXI) relocated.
8. Prospect, east of Walters Rd, (Penrith XI, Sydney XXII).
9. Eastern Creek, west of Horsley Road (Penrith X, Sydney XXIII) Two fragments.
10. Eastern Creek, west of Minchinbury Cellar Entrance, (Penrith VIII, Sydney XXV)
11. Mt Druitt, east of Chatsworth Road (Penrith VII, Sydney XXVI).
12. St Marys, west of Marsden Road (Penrith V, Sydney XVIII).
13. St Marys, east of Mamre Road (Penrith IV, Sydney XXIX).
14. Quarry Hill, east of Gipps St. (Penrith III, Sydney XXX).
15. Werrington, west of O'Connell St. (Penrith II, Sydney XXXI).
16. Kingswood, west of Bringelly Rd, (Penrith I, Sydney XXXII).

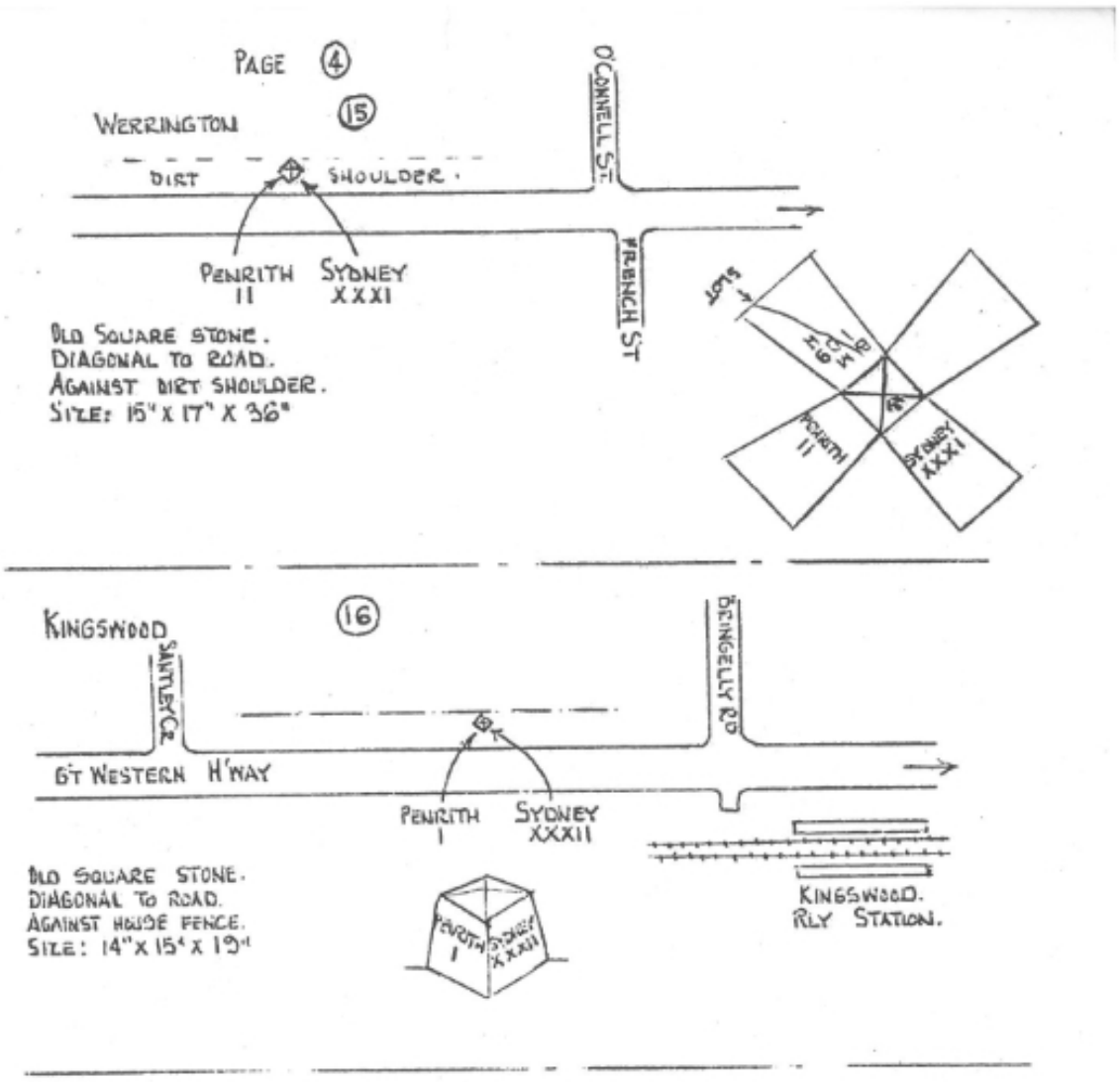
National Trust of Australia (N.S.W.) Listing Proposal NTN 05



— PARRAMATTA TO PENRITH —
LOCATION OF MILESTONES
— SYMBOLS —
FENCE:
NOT TO SCALE.
SYDNEY END
GREAT WESTERN HIGHWAY
TO PENRITH
MILESTONES: (TOP)
15"
15"
2"
16"
16"
5"
NORMAL TYPE
30"
17"
ONE ONLY (Nº4)
22"
FOOTPATH
DIAGONAL TO ROAD. (NORMAL)
FOOTPATH
PENRITH MILEAGE
SYDNEY MILEAGE
SQUARE ON TO ROAD (2 ONLY)
SYDNEY MILEAGE
PENRITH MILEAGE
① MAYS HILL
PENRITH XVIII
SYDNEY XV
PITT
STREET
STEELE ST
1 CEMETERY
OLD PARRAMATTA BOUNDARY STONE.
MAYS HILL RESERVE
TOP
SYDNEY XV
PENRITH XVIII
PARRAMATTA
GOVERNOR 1839
40"
22"
OLD SQUARE STONE.
SQUARE ON TO ROAD.
16INS. EX GUTTER.
ABOUT 30M EX PITT ST.
SIZE: 15" X 15" X 33"
PREVIOUS MILEAGE CHIPPED OFF.
ANOTHER SIMILAR STONE IS LOCATED UNDER ASTON ST BRIDGE OVER PARRAMATTA RIVER. SAME WORDING.
OLD SQUARE STONE.
LOCATED IN FENCED AREA.
SLIGHTLY TILTED SOUTH-EAST.
WORDING IN SAME DIRECTION.
SIZE: 20" X 22" X 40".
②
FRANCES ST
BRIDGE RD.
PENRITH XVII
SYDNEY XVI
OLD SQUARE STONE.
DIAGONAL TO ROAD.
20 FT. EX GUTTER.
SIZE: 15" X 17" X 33"
③
CERAMIC TILES
BERITH ST
JONES ST.
PENRITH XVI
SYDNEY XVII
OLD SQUARE STONE
DIAGONAL TO ROAD.
9FT EX GUTTER.
SIZE: 15" X 17" X 35"
RECHECKED 3.5.80
19.1.79.


PAGE (2)
4
BRACKNEY ST.
BERESFORD RD.
GT WESTERN HIGHWAY
TARGO RD.
PENRITH XV
SYDNEY XVIII
OLD SQUARE STONE
DIAGONAL TO ROAD.
5FT. EX ROAD.
SIZE: 16"x17"x22"
5
QUARRY RD.
To PENRITH
PENRITH XIV
SYDNEY XIX
BLACKTOWN RD.
OLD SQUARE STONE.
DIAGONAL TO ROAD.
1 FT. EX GUTTER.
NOTE: THIS MILESTONE TILTED 11.1.79, BROKEN UP BY MOTOR VEHICLE ACCIDENT BETWEEN 11.1.79 AND 18.1.79. NOW REMOVED BY D.M.R.
6
PROSPECT RESERVOIR.
TREES
OLD WESTERN RD.
THORNLEY RD.
PENRITH XIII
SYDNEY XX
CHURCH LANE
OLD SQUARE STONE.
DIAGONAL TO ROAD.
6FT. EX ROAD.
COVERED BY TREES.
SIZE: 16"x17"x33"
FLUSHCOMBE RD.
7
REED RD.
To F4
PENRITH XII
SYDNEY XXI
RELOCATED IN LATE 1979 BY D.M.R. TO GT. WESTERN HIGHWAY.
GREAT WESTERN HIGHWAY
OLD SQUARE STONE
DIAGONAL TO ROAD.
40FT EX FLUSHCOMBE RD.
1 FT EX HIGWAY.
SIZE: 16"x16½"x44".
OTHER MILEAGES ERASED.
8
OLD WESTERN ROAD
F4 FREEWAY
DOG KENNEL RD
PENRITH XI
SYDNEY XXII
GREAT WESTERN HIGHWAY
WALTERS RD.
OLD SQUARE STONE
DIAGONAL TO ROAD.
ON 4FT HIGH EMBANKME
SIZE: 15"x17"x36"
ND 19.1.79.
RECHECKED 3.5.80


N
PAGE (3)
(9)
HORSLEY RD
GREAT WESTERN H'WAY
BROOKSIDE RD
O HOLE IN FOOTPATH.
□ 2 PIECES OF MILESTONE IN PRIVATE PROPERTY. NOW RENOVED BY D.M.R.
PENRITH X
SYDNEY XXIII
(10)
OLD ENTRANCE TO WINCHINBURY CELLAR
PENRITH VIII
SYDNEY XXV
OLD SQUARE STONE. DIAGONAL TO ROAD. 3FT. EX GUTTER. SIZE: 15"x17"x36"
OTHER MILEAGES ERASED
(11)
CHATSWORTH RD
MILESTONE NURSERY
PENRITH VII
SYDNEY XXVI
OLD SQUARE STONE. DIAGONAL TO ROAD. 9FT. EX GUTTER. SIZE: 15"x17"x36"
(12)
DAY ST
MASSDEN RD
PENRITH V
SYDNEY XXVIII
OLD SQUARE STONE. DIAGONAL TO ROAD. 2FT. 6INS. EX GUTTER SIZE: 15"x17"x37"
SYDNEY ST
(13)
NAMOI ST
QUEEN ST
PENRITH IV
ST MARYS BAND CLUB
SYDNEY XXIX
OLD SQUARE STONE DIAGONAL TO ROAD AGAINST FENCE SIZE: 15"x16"x24"
(14)
GIPPS ST
FRUIT STALL
PENRITH III
SYDNEY XXX
OLD SQUARE STONE DIAGONAL TO ROAD 6IN. EX FENCE SIZE: 15"x17"x36"
№ 19.1.79
RECHECKED 3.5.80.


PAGE 4
15
WERRINGTON
DIRT
SHOULDER
O'CONNELL ST
FRENCH ST
PENRITH II
SYDNEY XXXI
OLD SQUARE STONE.
DIAGONAL TO ROAD.
AGAINST DIRT SHOULDER.
SIZE: 15" X 17" X 36"
SLOT
PENRITH II
SYDNEY XXXI
16
KINGSWOOD
SANTLEY CR
BRINGELLY RD
GT WESTERN H'WAY
PENRITH I
SYDNEY XXXII
OLD SQUARE STONE.
DIAGONAL TO ROAD.
AGAINST HOUSE FENCE.
SIZE: 14" X 15" X 19"
KINGSWOOD.
RLY STATION.

Heritage Inventory Sheet

Item Name	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		
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	I01945	
Former LEP ID	01945 (State) Lower Prospect Canal Reserve; 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

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)*

	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. Cumberland Plain Woodland is identified as a critically endangered species under both *the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999*) and *the Threatened Species Conservation Act 1995 (TSC Act 1995)*. 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. 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.
b) Associative	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. 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
c) Aesthetic/Technical	The Lower Prospect Canal has state significance for its technical values. 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. 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. It is one of the earliest examples in NSW of the large-scale application of precast reinforced concrete construction. 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.

	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. 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.
d) Social	The item does not meet this criterion.
e) Scientific	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. 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.
f) Rarity	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. 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.
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 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

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

** element detracts from the overall cultural significance of the place*

Historical Notes	
Construction years	1880-1888

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 though 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 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	▪ 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	▪ 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	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 Pipehad (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.

Heritage Inventory Sheet

Item Name	Water supply pipeline; Viaduct carrying main pipelines; Water pipelines; and Auburn Road bridge over water pipeline		
Recommended Name	Pipehead to Potts Hill Pipelines		
Site Image			
Address	27 Frank Street Guildford West, NSW 2161 (Pipehead) to corner Kingsland Road and Dunbar Avenue, (Regents Park), NSW, 2143		
Lot/Section/DP	2	-	774696
	2	-	225812
	1	-	225813
	1	-	1227257
	1	-	225815
	1-3	-	225816
	1	-	623945
	1	-	225817

	109	-	1142117
Draft Cumberland LEP ID	I298		
Former LEP ID	A59 (Auburn LEP), Water supply pipeline; I44 (Holroyd LEP), Viaduct carrying main pipelines; I223 (Parramatta LEP), Water pipelines; and A60 (Parramatta LEP), Auburn Road bridge over water pipeline		
Heritage Conservation Area	Not included		
Date Updated	March 2020		
Significance Level	LOCAL		
Site Type	Level 1	Complex/Group	
	Level 2	Utilities - Water	

Curtilage Map

This is a consolidated curtilage of the former heritage listings for this item.

Revised curtilage recommended – refer below

Statement of Significance

The following statement of significance has been quoted from the NSW Office of Environment and Heritage, Section 170 Heritage and Conservation Register listing sheet for 'Pipehead to Potts Hill Pipelines' (2016).

The significance attached to these pipelines stems from their association as an integral element with the Upper Nepean Scheme, Sydney's first reliable water supply. The scheme was the first of its kind in NSW. It involved the harvesting of water in the Southern Highlands and major transportation to Sydney via canals, aqueducts and pipelines. The storage was initially only at Prospect Reservoir, but years later major storages were added at Cataract, Cordeaux, Avon and Nepean. There had been a similar scheme in Yan Yean outside Melbourne in 1856, as well as others at Bendigo and Ballarat. The scheme was the first of its kind in Australia and involved the harvesting of water in the Southern Highlands, storage thereof and then major transport to Sydney via canals, aqueducts and pipelines. The Pipehead to Potts Hill Water Supply consists of three pipelines built between 1888 and 1925. In particular, Pipeline No.1 commissioned in 1888 is especially significant, as this was the first link between Pipehead (at Guildford) and the Potts Hill No.1 Reservoir, the scheme's major service reservoir for the gravitational supply of Sydney's water. Now, over 100 years since the Upper Nepean Scheme was commissioned, the pipelines have not become obsolete, but by virtue of boosters, are still key components of Sydney's water supply system. In addition, the pipelines display superb late 19th century hydraulic construction techniques which were state-of-the-art technology of the time in Australia. Also, the three pipelines laid side by side illustrate the advancements in major pipeline construction over a span of some 37 years. Pipeline No.1 (1888) was constructed from wrought iron, Pipeline No.2 (1900) from mild steel and Pipeline No.3 (1925) from electrically welded steel plates. Finally, it was the changeover from open canal to No.1 Pipeline that gave Pipehead its name, further

adding to the significance of the pipelines. The site is now arguably the most important operations and control centre for Sydney's water supply system. The pipes are a visual feature of the landscape along which they run. The physical curtilage of the Pipehead to Potts Hill Pipelines extends to the boundary of Sydney Water Corporation land along the route of the pipelines. The curtilage includes the pipelines and all infrastructure associated with the pipelines such as valve houses, flow metres, cross-connections and pumping stations.

Criteria Assessment	
a) Historic	The historic significance of these pipelines stems from their association with the Upper Nepean Scheme, Sydney's first reliable water supply. Pipeline No.1 has the highest historic significance as it was constructed as part the original scheme which was commissioned in 1888. Pipelines No. 2 and 3 were added to the scheme as it was progressively amplified.
b) Associative	The item does not meet this criterion.
c) Aesthetic/Technical	The three pipelines run parallel together, supported on their own easements. Laid side by side they provide a graphic display of the technical developments in pipeline construction over the period from 1888 to 1925. They are a significant feature of the landscape and are readily visible from many public reserves and parks, and from many major roads that are constructed above the pipeline.
d) Social	Over 130 years since the first pipeline was commissioned, the pipelines are still key components of the modern water supply system from Pipehead to Potts Hill. Pipehead itself is the most important operation and control centre for Sydney's water supply system.
e) Scientific	The Pipehead to Potts Hill Water Supply Pipelines display superb late 19th century hydraulic construction techniques typical of the state-of-the-art technology of the time.
f) Rarity	The pipelines were progressively built between 1885 and 1925. The pipelines were built as part of the Upper Nepean Scheme, Sydney's first reliable water supply. Consequently, the age of the pipelines make them rare within the Sydney Water system.
g) Representativeness	The pipelines are representative of the early water supply system, progressively built between 1885 to 1925. They were built as part of the Upper Nepean Scheme, Sydney's first reliable water supply. They are therefore representative of hydraulic construction techniques of the late 19th century.

Physical Description

Pipeline

The water supply from Pipehead to Potts Hill consists of four pipelines, three of which are laid side by side with one underground. The length of the three visible pipelines (Nos. 1-3) is 7,835 metres and they are 72 inch (1800mm) in diameter:

- No. 1 Main: completed in 1888 as part of the Upper Nepean Scheme. It is constructed from 4 wrought iron plates (each plate 3.66m long) riveted together to form a circular pipe. The pipes are connected by means of wrought iron collars and lead joints.
- No. 2 Main: completed in 1900 from fabricated mild steel plates also connected by riveting, now cement lined.
- No. 3 Main: completed in 1925 and consists of pipes 6.7m long. It is constructed from electrically welded steel plates, connected by steel collars with lead joints.
- No.4: completed in 1974 is a 3000mm (diameter) pipe in tunnel underneath No.1, 2 and 3 and is not visible above ground.

The Pipehead to Potts Hill Pipelines are an operational asset, owned, managed and maintained, by Sydney Water. They are in a good condition, although they show signs of age and use.

Auburn Road Bridge
The Auburn Road Bridge over the Water Mains forms an integral part of the Upper Nepean Scheme. This is one of a number of road bridges over the mains, built by the MWS & DB. It is a typical road bridge across the Upper Nepean Scheme Water Supply Mains, comprising a 2 lane concrete deck, supported on concrete abutments and piers. A footpath is provided on the west side, with steel lattice work and rail balustrade. This listing includes the wrought iron gate onto Sydney Water property on the south side of the bridge, and the east side of Auburn Road.

Condition	**Good**	Fair	Poor

Alterations and Additions

- All of site is located within the Sydney Water property boundaries and was physically inaccessible. As a result, the degree and nature of possible alterations was not able to be observed from site inspection.

The integrity of the item could not be confirmed from the site inspection. It is likely that the item has been modified extensively during necessary upgrades to the system, though the route and function of the pipeline remains the same. Although likely modified in line with operational standards, the item retains high integrity.

Integrity	**High**	Moderate	Low

** element detracts from the overall cultural significance of the place*

Historical Notes

Construction years	1888- 1925

The water supply pipelines are part of the Upper Nepean Scheme. The following historical overview of the Upper Nepean Scheme has been quoted in part from the NSW Office of Environment and Heritage, Section 170 Heritage and Conservation Register listing sheet for 'Upper Nepean Scheme' (2016).

In 1867, the growth of Sydney coupled with recurring dry seasons, brought into sharp focus the pressing need for a water supply, which was larger and more reliable than the existing Botany Swamps source. This led the Governor (Sir John Young) to appoint a special Commission to investigate how an adequate long term supply might be achieved.

The Commission reported in 1869 and recommended the Upper Nepean Scheme whereby water from the head waters of the Upper Nepean River and its tributaries, the Avon, Cordeaux and Cataract Rivers, would be conveyed by canal, tunnel, pipe and aqueduct to a storage reservoir to be built at Prospect. From there another canal would carry the water to a basin at Guildford from where it would be piped to a smaller service reservoir at Potts Hill for distribution to Sydney.

After a lapse of six years during which no decision was made, and a number of alternative proposals were circulated, the government decided to engage an eminent English civil engineer, W. Clark, M.I.C.E., to review the various proposals. Clark arrived in November 1876 and, in May 1877, after reviewing eight schemes, strongly endorsed the Upper Nepean Scheme.

An Appropriation Act was passed in July and work commenced in 1880. Construction was carried out by contractors under the direction of the Harbours and Rivers Branch of the Public Works Department. The head of that branch was Edward Orpen Moriarty, who contributed a great deal to public engineering works of the time. He was responsible for both the design and execution of the works and had a number of site engineers under him. His signature appears on most of the plans of the Scheme.

When the Scheme had initially been proposed in 1869, Moriarty had then drawn up plans for parts of the system, such as weirs and aqueducts. Between 1869 and when work actually commenced in the 1880s, alterations had been made to the initial plans. In 1869, Moriarty had proposed to bridge the

creeks, which the Upper Canal would cross by means of aqueducts with approaches built on top of dry rubble stone walls. When the Scheme was finally under construction in 1884, he drew up new plans to cross these creeks with wrought iron inverted syphons.

Work proceeded as rapidly as possible once contracts were let, but by June 1885, because of continued dry seasons, there were only about ten days supply remaining in the Botany Swamps. In response to urgent demands for relief, the government of the day accepted an offer made by the Sydney engineering firm of Hudson Brothers (later to be incorporated as Clyde Engineering) to provide a temporary supply by bridging the gaps in the Upper Canal where creeks remained to be crossed, and, also, carrying the water from Pipe Head by elevated temporary fluming to the Botany Swamps.

Matters proceeded rapidly and, when a bond to commence the work was signed on 3 September 1885, work was already underway. Maximum use was made of the firm's workshops at Redfern and Granville to fabricate the various components, including the manufacture of 1200 cast iron pipes. Many of these 36 inch diameter pipes were laid to operate as inverted syphons, supported on timber trestles above flood level, over the creeks intersecting the route of the Upper Canal.

Hudson's Emergency Scheme delivered its first water in January 1886 and functioned until the Upper Nepean Scheme was commissioned in 1888, after which it was dismantled and sold.

Construction and Operation of the System

The great merit of the Upper Nepean Scheme is that it was, and still is, a gravity one. Water harvested in the Southern Highlands, when diverted by the Pheasants Nest and Broughtons Pass weirs, flowed all the way down the Upper Canal into Prospect Reservoir, thence along the Lower Canal to Pipe Head, then by pipe to Potts Hill Reservoir and again by pipe to Crown Street Reservoir from where it was reticulated to the major portion of the city and suburbs of the time, all by gravity.

The Upper Canal was built of a variety of materials with section profiles depending upon the nature of the country through which it was passing. Where the ground was soft, the Canal was V shaped and the sides were pitched with shale or sandstone slabs. In other sections, a U shape was utilised and here the sides were walled with sandstone masonry, or, if cut into solid rock left unlined. Where the canal had to go under a hill, tunnels were excavated. These were left unlined if cut through in solid rock, or lined with brick or stone, if cut through softer material. Where the canal crossed creeks or large depressions, such as Elladale, Simpson's, Ousedale, Mullaly, Woodhouse, Nepean and Leaf Creeks, the water was carried across in wrought iron inverted syphons resting upon stone piers.

The Lower Canal was constructed in similar fashion to the Upper Canal although most of it was built as a V section open cutting lined with stone pitchers. Below Prospect Hill, it entered what was called the "covered way". In 1903, the covered way collapsed when the Canal was emptied and it was rebuilt in concrete.

The Lower Canal terminated at Pipe Head Basin, initially built simply as the point at which the water was let into a 72 inch pipe feeding the Reservoir at Potts Hill. At Potts Hill, the water was screened to remove dirt, vegetable matter and other unwanted debris. From Potts Hill, the water was then piped under gravity pressure to consumers in the various parts of Sydney.

The water supply was managed by a Resident Engineer, housed at Veteran Hall at Prospect Reservoir until 1912, when the construction of an additional Reservoir at Potts Hill meant that he needed to be housed at that site for better supervision. In 1933, the position of Resident Engineer to control Head Works, was created, and the incumbent was housed at Pipe Head.

By 1898, a telephone line was in operation along the whole length of Upper Canal. In that year, the existing line was duplicated. That line was an integral element in controlling the System. Maintenance men were positioned along the Upper Canal, at Prospect, and at Pipe Head. At the weirs and at Prospect Reservoir, there were valve controllers responsible for the discharge of water along the system.

Progressive Development of the Upper Nepean Scheme after 1888

An outstanding feature of the Upper Nepean Scheme as originally envisaged and constructed was its potential for progressive development. Initially, it was a "run of rivers" scheme, because there was virtually no storage behind the Pheasants Nest and Broughtons Pass weirs. Immediately after its completion in 1888, drought and population growth necessitated its further development and this was implemented over a period of nearly fifty years by the construction of major storage dams on the Cataract, Cordeaux, Avon and Nepean Rivers as follows:

- Cataract Dam. Built 1907. First large cyclopean masonry dam in Australia.
- Cordeaux Dam. Built 1926. Curved concrete faced cyclopean sandstone.
- Avon Dam. Built 1927. Curved, concrete faced, cyclopean sandstone.
- Nepean Dam. Built 1935. Curved, concrete faced cyclopean sandstone.

The provision of these major storage dams changed the role of Prospect Reservoir from being Sydney's first storage reservoir to that of being a vital service reservoir to cover the daily fluctuations of demand in the distribution system.

The Upper and Lower Canals continued their role as the main arteries of the system, but upgrading was necessary. The Upper Canal needed only minor work to bring its capacity up to 150 million gallons per day but more extensive works were needed to improve the Lower Canal structure and increase its capacity. The capacity of the System downstream of Pipe Head was amplified by the progressive provision of additional 72 inch diameter steel mains, and, in more recent years, by their boosting with electric and diesel pumping stations. An additional major service reservoir was built at Potts Hill between 1913 and 1923.

The work on the Upper Canal consisted mainly of improving its flow characteristics by concreting rough spots on the bottom and sides, and replacing some stone pitching by concrete. By-passes were also provided around the wrought iron inverted syphons crossing the creeks to enable their internal maintenance when demand conditions permitted. Work to improve the capacity of the Lower Canal commenced in 1902. Initially, a length of 1909 lineal feet was reconstructed in concrete, and 646 lineal feet in Monier plates, i.e. pre-cast concrete slabs. An inquiry judged the Monier plates to be the better solution for upgrading the canal, and by 1912, the remaining walls of its whole 5 mile length had been raised 2 feet and lined by this method. The Lower Canal, as reconstructed, had its capacity increased from 50 to 93 million gallons per day whilst subsequent minor improvements and operating procedures have lead to its maximum current day capacity being 100 million gallons per day.

A feature of the Lower Canal was the Boothtown aqueduct of 22 brick arches, each 30 feet span, which carried the canal over a valley. From 1892 onwards, it suffered a series of structural failures to the brick sides of the water channel, until, in 1907, it had to be replaced by a reinforced concrete inverted syphon, 10 feet 6 inches in diameter, located in an earth bank beside the old aqueduct. This was the largest continuous concrete work of is kind constructed in Australia up to that time. It was fitted with the more modern "stoney gates", which were also used to replace the earlier "butterfly" gates to Broughton's Pass in 1912.

As previously mentioned, Prospect Reservoir was completed in 1888, but in 1898, its storage level was raised by 1 foot 8 inches to give it greater operating capacity. The Prospect earthen bank, with its clay core, suffered a series of slumps in 1893, 1898, 1899, 1902. Various remedial measures were carried out, and these included:

i) The driving of tunnels into the downstream toe to relieve soakage water, and their later conversion to permanent rubble drains.
ii) The placing of 12,000 cubic yards of blue metal spawls on the upstream slope at the slump areas to stabilise the toe of the bank
iii) Renewal of parts of the leaking clay puddle core
iv) Later extensive re-making of the puddle core down to a depth of 40 feet and further weighting of the toe of the embankment.

By 1905, the situation was stabilised, and the technique developed of keeping the clay puddle core suitably moist by means of surface drains to stop its alternate shrinking and expanding with consequential leakage and earth movements.

Although no serious trouble was experienced from then on, in 1980, the Board completed a major strengthening of the dam by greatly increasing the volume of the downstream side of the embankment and providing improved drainage facilities in the light of modern knowledge of the stability of earth dams. This work did not alter the length or height of the wall, or the top water level, but only the volume and slope of the downstream side.

As the ever-increasing demand for water was met by the construction of the major storage dams previously mentioned, the provision of additional conduits to carry it to the city was also necessary. Particularly deficient was the system between Prospect Reservoir and Pipe Head where the amplified Lower Canal could carry only 100 million gallons per day as compared with the 150 million gallons per day the Upper Canal could carry to Prospect from the dams.

In 1926, a scheme was considered whereby a pressure tunnel would be built between Cecil Hills on the Upper Canal to link up with another pressure tunnel then under construction between Potts Hill and Sydney, thus by-passing Prospect, the Lower Canal, Pipe Head and Potts Hill. This would have been extremely expensive, and, in the event, a 54 inch diameter woodstave main was constructed from the Upper Canal not far from where it entered Prospect Reservoir to the Pipe Head basin and then on to Potts Hill. It was completed in 1927 and could deliver 50 million gallons per day to Pipe Head and Potts Hill or 33 million gallons per day to Potts Hill alone. Later in 1937, it was replaced by a 72 inch (1,800 mm) diameter steel main laid between the Upper Canal, from just before its discharge into Prospect Reservoir, and Pipe Head. This main could also be fed directly from Prospect Reservoir. It had a capacity of 84 million gallons per day under Upper Canal head and 45 million gallons per day (later 60 million gallons per day) under Prospect head. Still later, in 1958, when Warragamba water became progressively available to Prospect Reservoir, an 84 inch (2,100 mm) diameter steel pipeline was commissioned between Prospect and Pipe Head with a capacity of 90 million gallons per day.

In more recent years, pumping stations have been constructed to boost the flow through these conduits.

Until 1913, screening of the water was carried out in a large circular screening chamber at Potts Hill, so that, with the changeover of the Ryde Pumping Station suction offtake to Pipe Head in 1903, screens had to be provided there also.

Between 1913 and 1928, three screening basins each 250 feet long by 40 feet wide were constructed at Pipe Head and became a key installation in the System. The entry of water to each chamber was controlled by a "stoney gate".

The scheme has continued to be modified and expanded to meet Sydney's water supply needs. This includes the construction and operation of a water filtration plant (not owned by the SCA) and the Raw Water Pumping Station completed in 2007. A chlorination plant was installed at Broughtons Pass in 1948 for disinfecting the flow into the Upper Canal after periods of heavy rain. In June 1960, following the installation of a more modern plant, continuous chlorination was implemented to operate under all flow conditions.

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).	
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).	
3. Consider delisting as an individual item from the LEP.		**8.** Maintain heritage landscape elements and schemes.		**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).			
5. The heritage curtilage for this item should be revised/reduced.	**X**	**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 A59 (Auburn); I44 (Holroyd); and I223 (Parramatta) has been revised to reflect the Sydney Water S170 Heritage and Conservation Register listing for 'Pipehead to Potts Hill Pipelines'. The curtilage should end at the corner of Kingsland Road and Dunbar Avenue, (Regents Park), NSW, 2143 to reflect the boundary of the Cumberland LGA. The curtilage map below reflects this revised curtilage and should be integrated into the Cumberland LEP.

Listings		
Heritage Listing	Listing Title	Listing Number
Heritage Act – State Heritage Register	N/A	-
Local Environmental Plan	Water supply pipeline; Viaduct carrying main pipelines; Water pipelines; and Auburn Road bridge over water pipeline	I299
Heritage Study	Water supply pipeline; Viaduct carrying main pipelines; Water pipelines; and Auburn Road bridge over water pipeline	I299
National Trust Australia Register	Pipe Head to Potts Hill Water Supply Pipelines and Boosters	N/A
Sydney Water s.170 Register	Pipehead to Potts Hill Pipelines	4570097

Previous Studies

Type	Author	Year	Title
Heritage Study	Extent Heritage Pty Ltd	2019	Cumberland LGA Heritage Study
Heritage Review	National Trust (Parramatta Branch)	2004	Parramatta Heritage Review
Heritage Study	Graham Brooks & Associates	1996	Sydney Water Heritage Study
Heritage Study	Neustein & Associates	1996	Auburn Heritage Study
Heritage Study	Terry Kass	1995	Draft Historical Context Report: Auburn Heritage Study
Heritage Study	Meredith Walker	1993	City of Parramatta Heritage Study
Heritage Study	Neustein & Associates	1992	Holroyd Heritage Study

Other References

- NSW Office of Environment and Heritage S170 listing sheet for Upper Nepean Scheme, retrieved 23 April 2019, https://www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=4580004
- Sydney Water S.170 Register listing sheet for 'Pipehead to Potts Hill Pipelines', https://www.sydneywater.com.au/SW/water-the-environment/what-we-re-doing/Heritage-search/heritage-detail/index.htm?heritageid=4570097&FromPage=searchresults

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 of pipelines from Military Road, Guildford.

View of pipelines from Military Road, Guildford.

View of pipelines from Barbers Road, Guildford.

View of pipelines from Barbers Road, Guildford.

Auburn Road Bridge (2019)

Auburn Road Bridge (2010)