Victorian Murray Floodplain Restoration Project

Belsar-Yungera Historical Heritage Desktop Assessment

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Lower Murray Urban and Rural Water Corporation

Victorian Murray Floodplain Restoration Project

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Abbreviations

CHL	Commonwealth Heritage List
EMP	Environmental Management Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
the Heritage Act	*Heritage Act 2017*
HHA	Historical Heritage Assessment
HIA	Heritage Impact Assessment
HO	Heritage Overlay
HV	Heritage Victoria
LGA	Local Government Area
mAHD	metres above Australian Height Datum
NHL	National Heritage List
NT	National Trust of Australia (Victoria)
the project	Belsar-Yungera Floodplain Restoration Project
R8	R8 joint venture
RNE	Register of the National Estate
VHI	Victorian Heritage Inventory
VHR	Victorian Heritage Register
VMFRP	Victorian Murray Floodplain Restoration Project
WHL	World Heritage List

Executive Summary

Project overview

The Belsar-Yungera Floodplain Restoration Project (the project) is one of nine discrete environmental works projects being undertaken as part of the Victorian Murray Floodplain Restoration Project (VMFRP), which is being implemented as part of Victoria's obligations under the Murray Darling Basin Plan. The VMFRP aims to restore a more natural inundation regime across more than 14,000 ha of high ecological value Murray River floodplain in Victoria through the construction of new infrastructure and modification of existing infrastructure.

The project is designed to facilitate managed inundation by isolating a large section of Narcooyia Creek and Yungera Creek from the Murray River, enabling these creeks to hold a water level of 52.3 m AHD. This is expected to be achieved through either the capture of a natural flooding event, pumping into the creek system over a period of time, or pumping into the creek system on top of a natural flooding event, extending the natural event in size and duration.

Construction activities would occur within the area of investigation identified in Figure 1.1-Figure 1.8. There are four distinct environmental works areas for the project including:

- Area 1 – Primary inundation area. Inundation to level of 52.3 m AHD using three large environmental regulators and eight supporting regulators and containment banks to provide an inundation area of approximately 1,539.7 ha.
- Area 2 – Lower J1 Creek area. Inundation to level of 52.9 m AHD using two environmental regulators and four supporting regulators and containment banks to provide an inundation are of approximately 526.24 ha.
- Area 3 – Upper J1 Creek area. Inundation to level of 53.3 m AHD using one environmental regulator and one supporting inflow structure to provide an inundation area of approximately 35.96 ha.
- Area 4 – Lake Powel and Lake Carpul Area. Inundation to level of 52.6 m AHD via two environmental regulators, a permanent pipeline and temporary pumping installation to provide an inundation area of approximately 272.19 ha.

Construction would involve use of vehicles and machinery such as trucks, excavators, and access equipment.

Desktop review

There are no listed historical heritage places that intersect with the area of investigation or the inundation area. Examination of the *Rural City of Swan Hill Heritage Study Stage II* in combination with a review of the parish maps and aerial imagery review has not identified any potential historical heritage places or archaeological sites within the area of investigation or inundation area.

There is moderate potential for previously unidentified historical heritage to be present within the area of investigation and the inundation area, based on a review of the background history of the area. Site types most likely to be identified would be places associated with early agricultural or pastoral activities and water management practices.

Impact assessment

There are no listed historical heritage places that intersect with the area of investigation or the inundation area. As such, neither the proposed works (Section 3.1) nor the proposed inundation area (Section 3.1.1) will impact upon any known historical heritage values.

However, the proposed works and inundation may impact upon previously unidentified historical heritage items or archaeological sites due to the moderate potential for such to be present within the area of investigation and inundation area.

Approvals, mitigation measures and recommendations

Table 1 summarises statutory requirements, mitigation measures and recommendations. If the scope of works changes to include other features of the heritage places detailed in Table 1, further heritage assessment would be required, and this assessment will need to be updated.

Table 1: Statutory requirements, mitigation measures and recommendations for heritage places within the area of investigation

Place	Statutory requirements	Recommendations	Mitigation measures
Entire area of investigation	Discovery of archaeological sites - under Section 127 of the *Heritage Act 2017*, If an archaeological site is discovered during construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to Heritage Victoria (HV).	Due to the moderate potential for previously unidentified historical heritage items or archaeological sites to be present within the area of investigation and inundation area, (as identified in Section 2.4), it is recommended that a Historical Heritage Assessment (HHA) be undertaken for the project. The HHA should include a field survey within the area of investigation to identify further historical archaeological sites and any unidentified historical heritage places, and a significance assessment of these potential historical places. If any historical heritage items or archaeological sites are identified as part of the HHA, a Heritage Impact Assessment (HIA) would be required: ▪ Assessment of impacts on all historical heritage sites ▪ Detailed identification of mitigation measures and approval requirements ▪ A Heritage Impact Statement. All historical archaeological places are protected under the *Heritage Act 2017*, whether they are registered or not. Further historical research to ascertain the likely presence of any historical archaeological places or material within the area of investigation is recommended to reduce the risk of delays to the project. Such delays would include the stoppage of works to avoid damage or destruction of historical archaeological sites and materials while the appropriate approvals are sought. This would enable VMFRP to proactively consider the nomination of historical heritage archaeological deposits ahead of the works, which would provide VMFRP with more certainty in relation to timeframes and statutory obligations. The completion of the HIA for the project would mitigate these issues.	General mitigation measures to be implemented across the area of investigation: ▪ Historical heritage awareness training should be completed as part of the site induction for all personnel and/or contractors prior to the commencement of construction works to ensure: - an understanding of where all heritage places are located within the area of investigation - an understanding of the potential heritage places that may be impacted during the project - the procedures required to be undertaken in the event of discovery of historical heritage material, features or deposits, or the discovery of human remains ▪ If an archaeological site is discovered during construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to HV A copy of this report should be kept onsite and on file with the project records. All contractors and/or project staff should be made aware of the heritage status of the heritage places in the area of investigation prior to works taking place.

Important note about your report

The purpose of R8's engagement under the Victorian Murray Floodplain Rehabilitation Project (VMFRP) is to design infrastructure for VMFRP including regulators, levees, roads, access tracks and culverts. The designs are required to be suitable for construction pricing to inform business case prioritisation. The purpose of this infrastructure is to allow floodplains to be watered at the hydraulic design levels nominated by VMFRP. R8 is also engaged to provide Regulatory Approvals and Cultural Heritage Services. The purpose of these services is to support VMFRP to lodge the necessary approvals documents for the project with the relevant approvals authorities.

The sole purpose of this report and the associated services performed by R8 is to complete a Desktop Historical Heritage Report for VMFRP in accordance with the scope of services agreed between R8 and VMFRP.

R8 has prepared this report in accordance with the usual care and skill expected of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. However, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

In preparing this report, R8 has relied on the information provided by VMFRP. In particular R8 is reliant on VMFRP's prior flood modelling work to define inundation levels and extents. R8 is not responsible for achievement of the project's desired operational ecological outcomes.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by R8 for use of any part of this report in any other context. This report has been prepared on behalf of, and for the exclusive use of VMFRP, and is subject to, and issued in accordance with, the provisions of the agreement between R8 and VMFRP. R8 accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

1.1 Project background

The Belsar-Yungera Floodplain Restoration Project (the project) is one of nine discrete environmental works projects being undertaken as part of the Victorian Murray Floodplain Restoration Project (VMFRP), which is being implemented as part of Victoria's obligations under the Murray Darling Basin Plan. The VMFRP aims to restore a more natural inundation regime across more than 14,000 ha of high ecological value Murray River floodplain in Victoria through the construction of new infrastructure and modification of existing infrastructure.

The VMFRP is being implemented in partnership between Lower Murray Urban and Rural Water Corporation (LMW), Goulburn Murray Rural Water Corporation (GMW), Mallee Catchment Management Authority (Mallee CMA), North Central Catchment Management Authority (North Central CMA), Parks Victoria and the Department of Environment, Land, Water and Planning (DELWP), and is funded by the Commonwealth Department of Agriculture, Water and Environment (DAWE). LMW has been nominated by the partnership as the project proponent for the purpose of submitting referrals and approval applications.

R8 is a joint venture formed between Jacobs and GHD, which has engaged by LMW to deliver design, cultural heritage and approvals services for the VMFRP. This desktop historical heritage assessment has been prepared for the project to support the preparation of referrals under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Victorian *Environment Effects Act 1978*.

1.2 Project location

The Belsar-Yungera Floodplain Restoration Project (the project) is partially located within the River Murray Reserve, and the localities of Tol Tol, Lake Powell and Boundary Bend, within the Swan Hill Local Government Area (LGA).

The following terms are used to describe the project area (Refer to Figure 1.1-Figure 1.8):

- Area of investigation - this includes the development footprint, as well as a substantial buffer around the development footprint and access tracks. The area of investigation extends along the Murray River north of the Murray Valley Highway, with a small section south of the highway between Lakes Powell and Carpul.
- Development footprint - this is the area that the project infrastructure will occupy. This does not include tracks used for access during construction and operation.
- Construction footprint - this includes the project infrastructure as well as the land required to construct the infrastructure. This includes access tracks.
- Inundation area - area of land subject to flooding during managed events, up to a specific design water level. The inundation area comprises the majority of the proposed Murray River Park on Belsar and Yungera Islands, land north of the Murray Valley Highway, and land surrounding Lakes Powell and Carpul.

1.3 Purpose of assessment

The purpose of this desktop cultural heritage due diligence assessment is to:

- Identify registered historic heritage places potentially impacted by construction works or managed inundation
- Identify likelihood of unregistered historic heritage being encountered in construction areas
- Describe likely approval requirements
- Describe further investigations and/or recommended management measures.

1.4 Desktop assessment

This desktop assessment involved the following activities:

- Register searches
- Review of previous heritage reports and local heritage studies, site cards and other site information (including a review and update of the existing historical archaeology due diligence assessment previously prepared for the project by Jo Bell Heritage Services (Bell 2013))
- Background historical research including historical maps and plans
- Synthesis of background information to identify known heritage places both in the area of investigation and within the inundation areas, and areas with potential for previously unidentified heritage places
- Summary of potential impacts and mitigation measures
- Identifying further heritage investigation required to meet legislative requirements and to minimise project risk
- Identifying approvals requirements under the *Heritage Act 2017*, local planning schemes, and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.5 Authorship

This report was prepared by Caroline Seawright (Project Archaeologist, R8) and Washule Bucknall (Undergraduate Cultural Heritage Consultant, R8). Mapping was prepared by Nicole Kiely (Senior Consultant – Spatial and Information Services, R8). A technical review was undertaken by Rose Overberg (Principal Heritage Consultant, R8).

1.6 Assumptions and limitations

The constraints are as follows:

- The assessment was undertaken using the assessment area provided on 16 March 2020 by Milos Pelikan (Principal Spatial Analyst, R8)
- No field investigation was undertaken
- The register searches were undertaken on 6 March 2020 and any findings within this report are based on those search results. As such, this report is accurate as to the date of that generation.

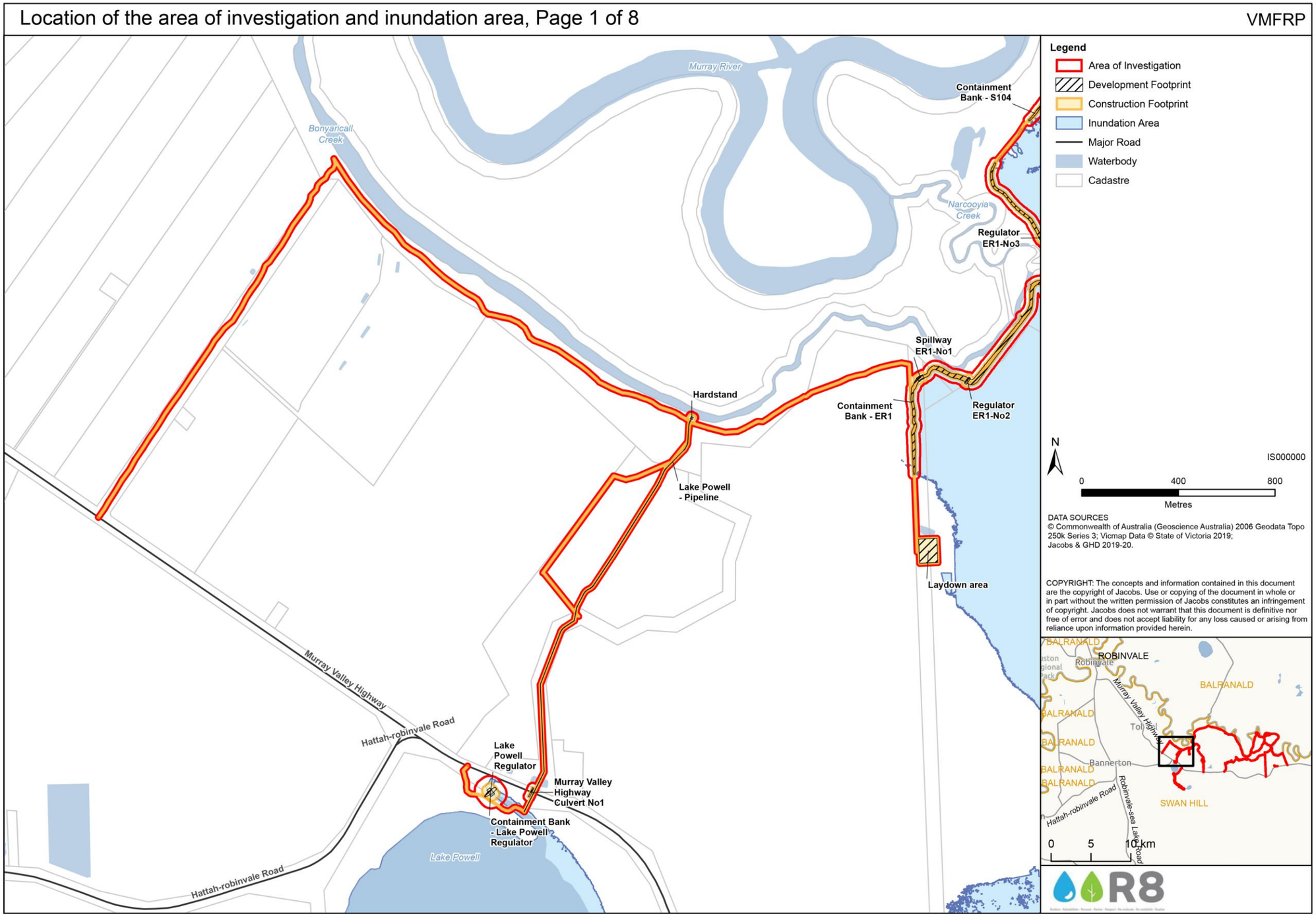

Figure 1.1: Location of the area of investigation and inundation area (Map 1 of 8)

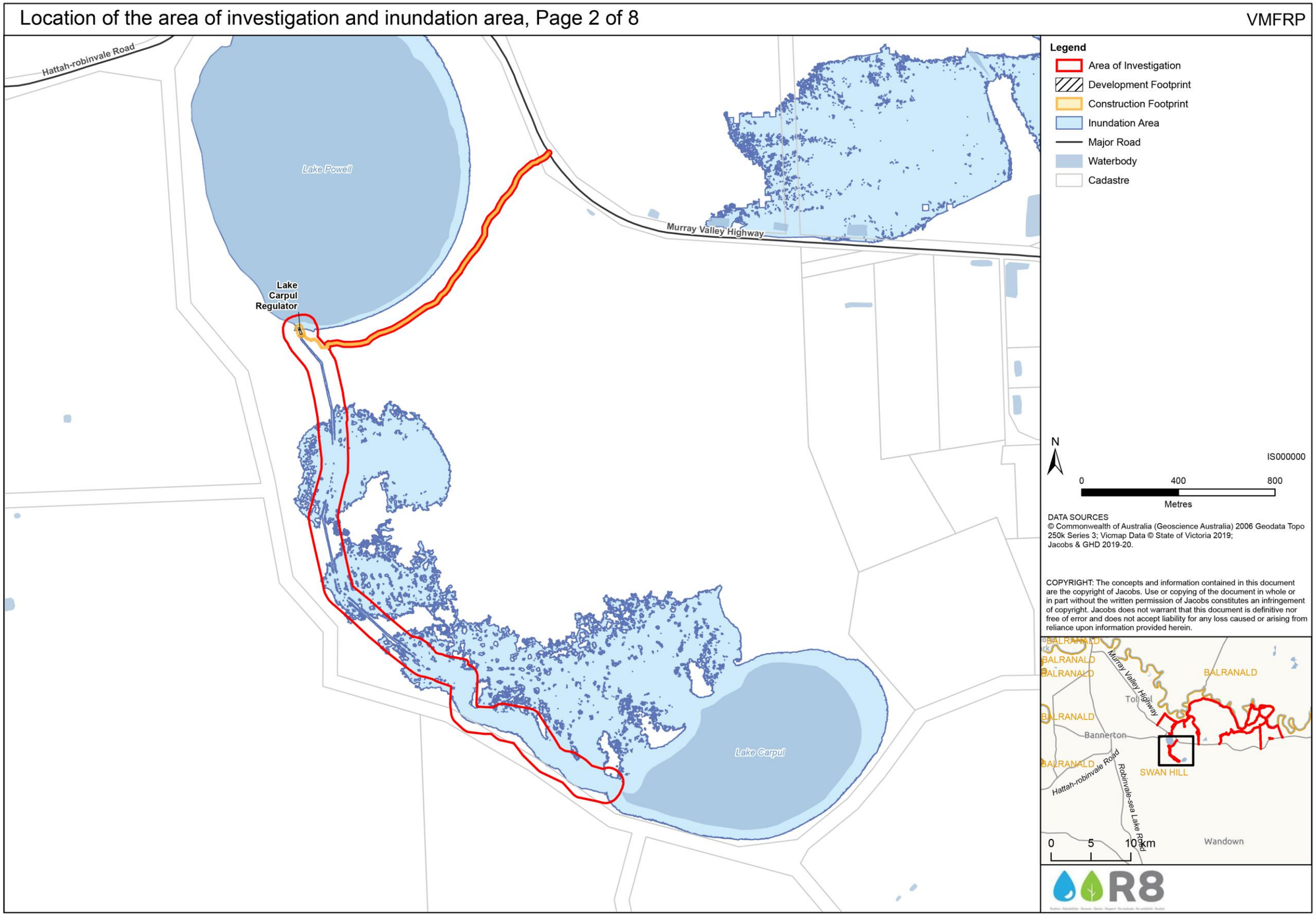

Figure 1.2: Location of the area of investigation and inundation area (Map 2 of 8)

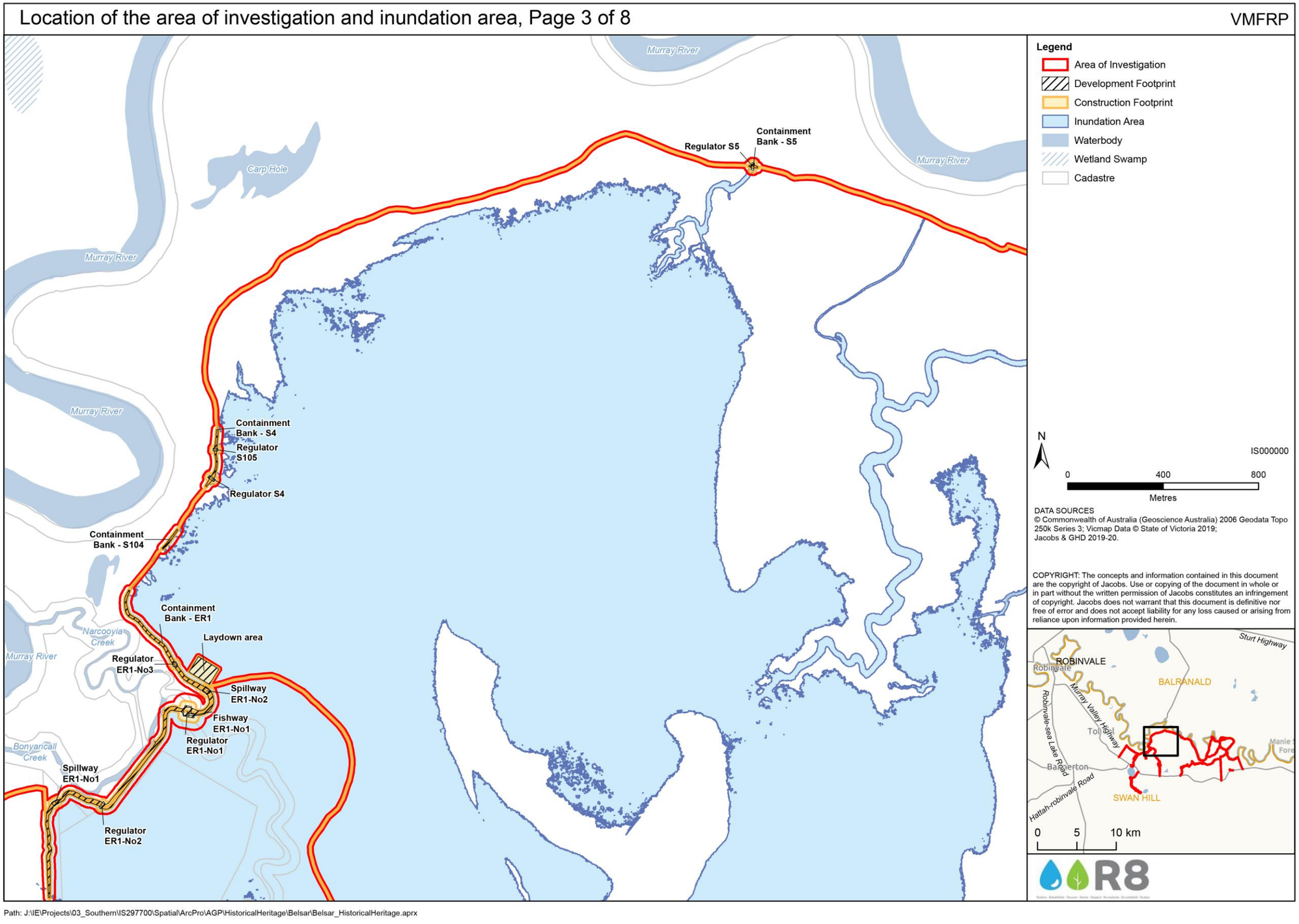

Figure 1.3: Location of the area of investigation and inundation area (Map 3 of 8)

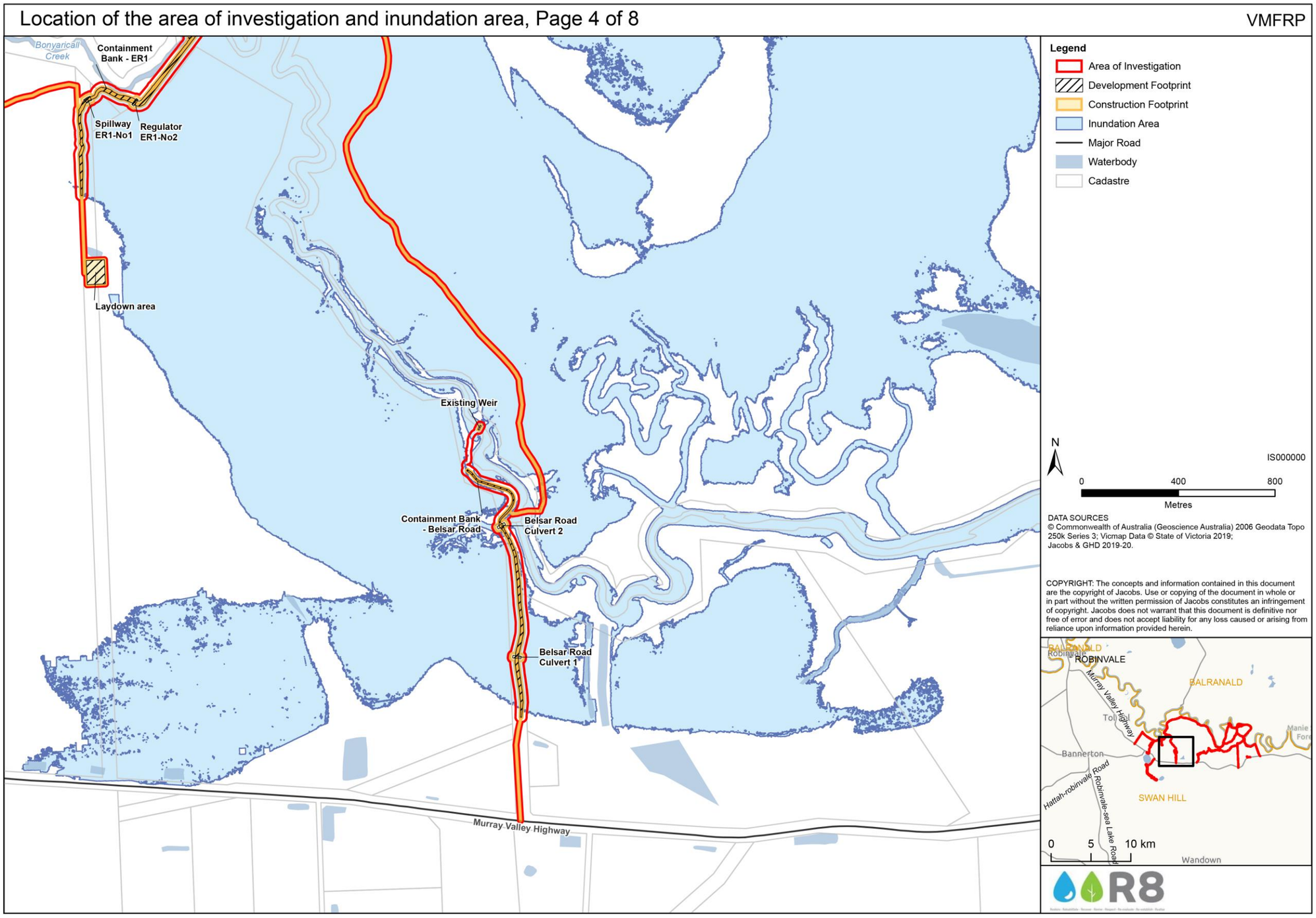

Figure 1.4: Location of the area of investigation and inundation area (Map 4 of 8)

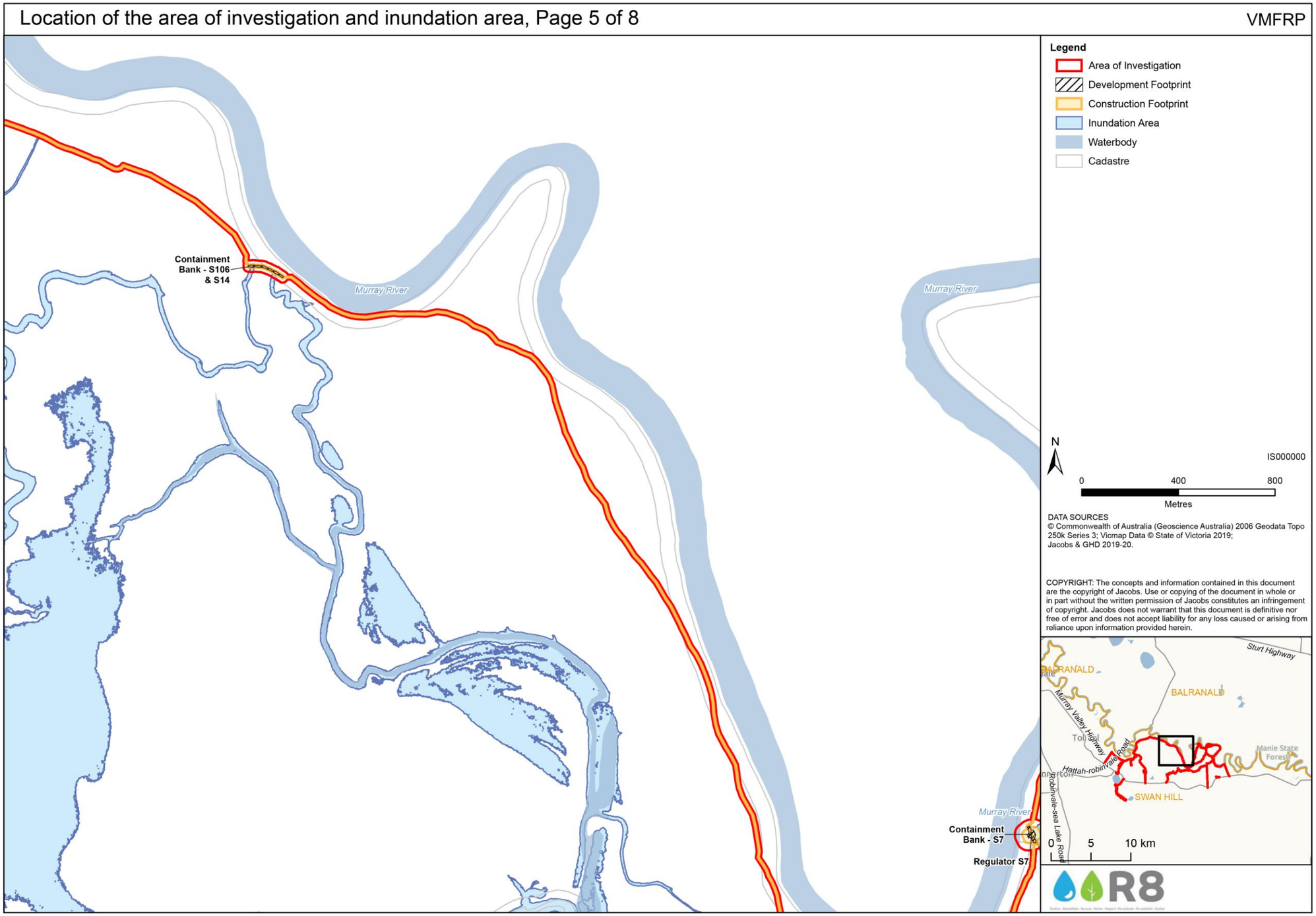

Figure 1.5: Location of the area of investigation and inundation area (Map 5 of 8)

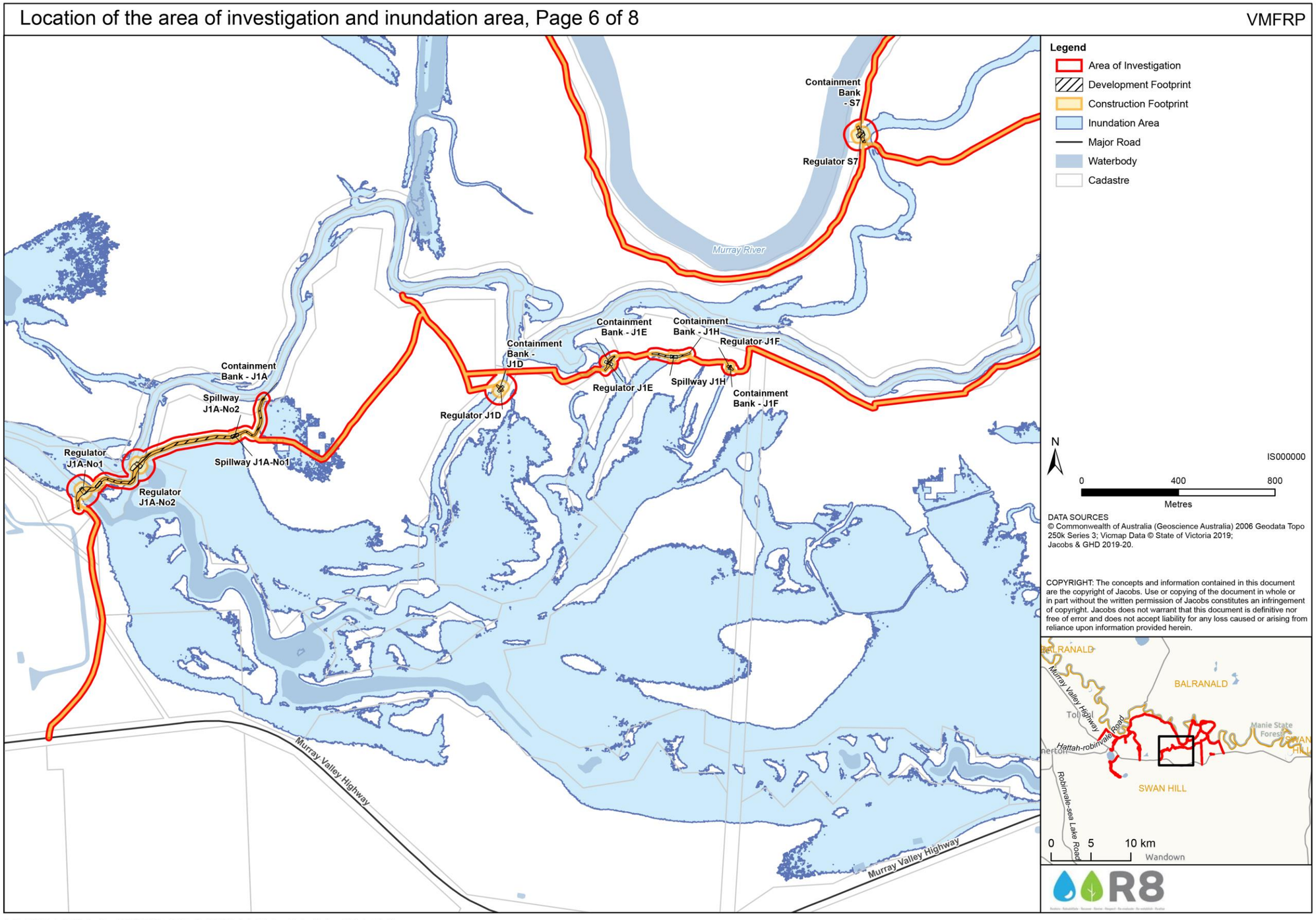

Figure 1.6: Location of the area of investigation and inundation area (Map 6 of 8)

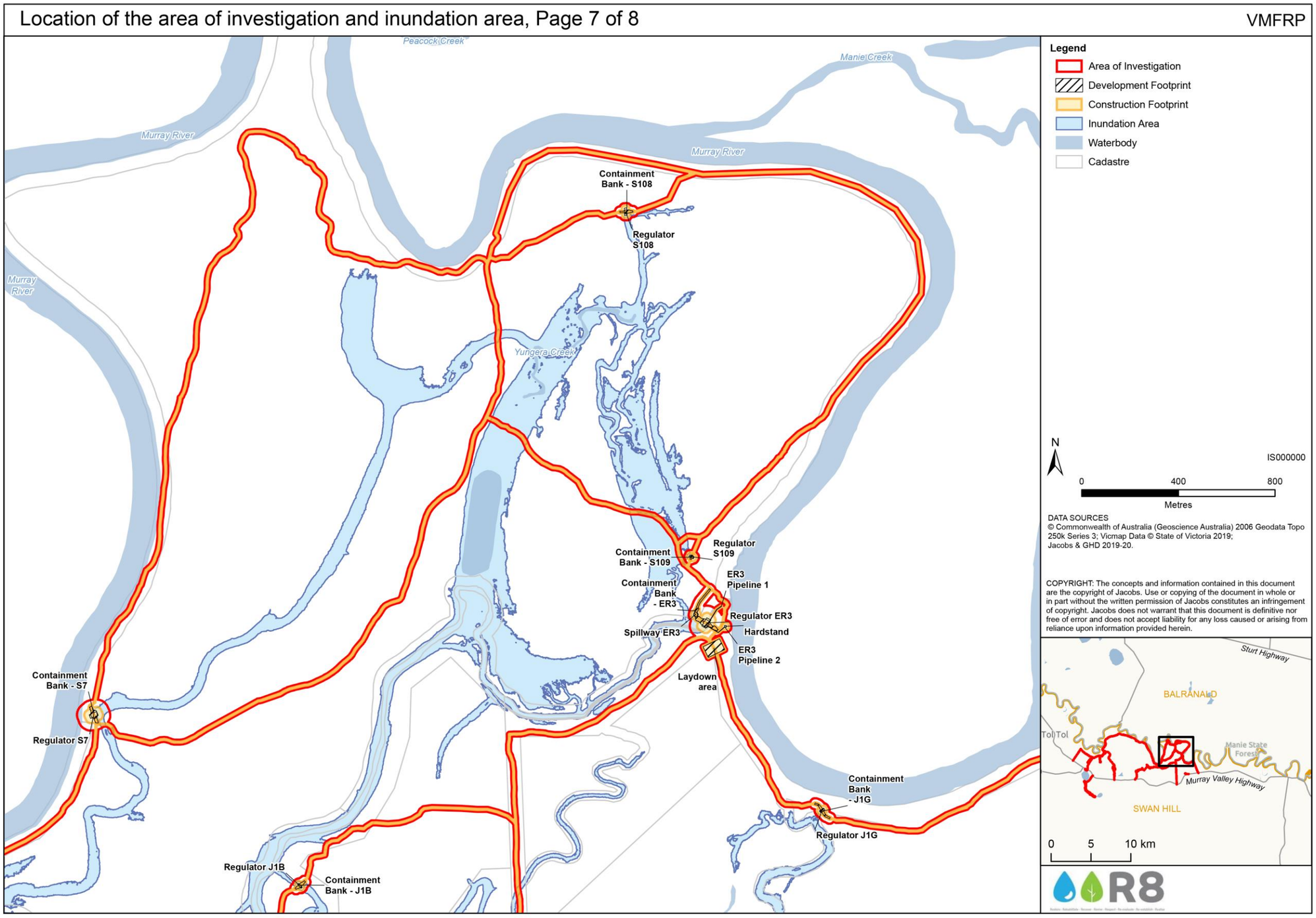

Figure 1.7: Location of the area of investigation and inundation area (Map 7 of 8)

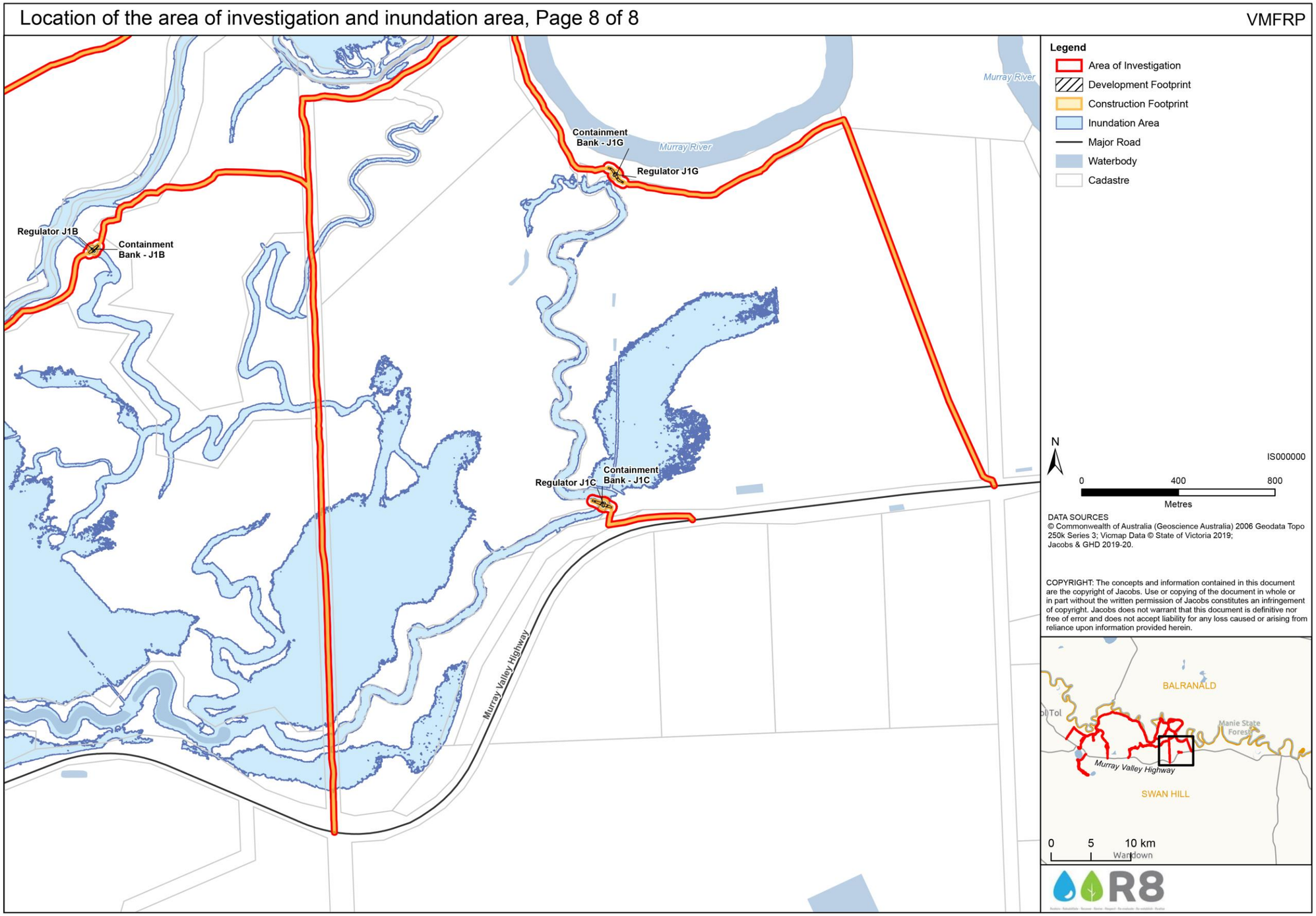

Figure 1.8: Location of the area of investigation and inundation area (Map 8 of 8)

2. Desktop review

2.1 Heritage context

2.1.1 Register searches

The following heritage registers were searched on 6 March 2020 by Caroline Seawright (Project Archaeologist, R8) to determine whether any known historical heritage places were present within or in proximity to the area of investigation and to the inundation area:

- Victorian Heritage Register (VHR)
- Victorian Heritage Inventory (VHI)
- Swan Hill Planning Scheme Heritage Overlay (HO)
- Commonwealth Heritage List (CHL)
- National Heritage List (NHL)
- World Heritage List (WHL)
- Register of the National Estate (RNE)
- National Trust of Australia (Victoria) (NT).

There are no historical heritage places within or adjacent to the project investigation or inundation areas (Figure 2.9).

The closest historical heritage place to the project and inundation areas is Yungera Homestead (HO207), located approximately 813 m to the east of the northern part of the area of investigation.

2.1.2 Previous historical heritage assessments

There have been three historical heritage investigations undertaken in the region relevant to the area of investigation (Table 2.1).

Table 2.1: Summary of the existing historical archaeology due diligence assessments

Author	Summary
Bell (2013)	Jo Bell Heritage Services undertook an historic due diligence assessment on behalf of the Mallee Catchment Management Authority (CMA) as part of proposed water management options on the Belsar-Yungera floodplain. The report was prepared for the proposed regulator sites, track raising and embankments situated on the Beslar-Yungera floodplain, located in the Parish of Nenandie and within the local government area of Swan Hill. The purpose of the report is to be used as a planning tool in identifying historic archaeological values to influence the design process for the proposed structures. Since then, the area of investigation has changed, and the areas assessed in the report only intersect with small sections of the current area of investigation. As such, the entire current area of investigation has not been assessed. During the desktop assessment, the report noted that no previous heritage assessments of the Belsar-Yungera floodplain had taken place. As such, the assessment area has not previously been systematically assessed for historic heritage or historic archaeological sites. A register search identified Yungera Homestead (HO207), located approximately 3.5 km east of the assessment area. No predictive model for archaeological potential was included in the report. The site inspection comprised an investigation of 100 m radius around each of the proposed structures, which comprised the assessment area. The site inspection indicated that logging was evident throughout the area. No historic archaeological sites or areas of archaeological potential were identified during the site inspection. The report noted that this may be due to the narrow scope of the investigation, which did not include access tracks to the structures except where they coincided with proposed track raising. As no historic features or areas of archaeological potential were identified, no significance assessments or detailed management recommendations were made.

Author	Summary
Allom Lovell and Associates (2001a; 2001b; 2001c; 2001d)	Allom Lovell and Associates completed a Stage II Heritage Study for the Rural City of Swan Hill in 2001, based on the Stage I project which commenced in 1998, which included the identification of potential sites of heritage significance, with 204 places were identified across the entire municipality. For each of these sites, the Stage II Heritage Study undertook further investigation, including a reassessment of each site to establish their cultural significance. After further research, Stage II compiled a list of 223 heritage places: six were recommended for inclusion on the VHR, the RNE, and the Swan Hill HO; 73 were recommended for the RNE, and the Swan Hill HO; 128 were recommended for the Swan Hill HO; and 16 places were ungraded due to demolition or insufficient levels of significance. One heritage place was identified at Boundary Bend. This comprised the *Eucalyptus porosa* (Black Mallee Box) (HO9), which was already listed on the HO and was recommended for listing on the RNE. This site is approximately 10 km east of the area of investigation. There were three additional sites located within Boundary Bend, noted as being located at Kyndalyn, comprising Weir Marker Piles (HO28), Farm House (HO29) and Charcoal Burning Site (HO30), which are all approximately 5-7 km east of the area of investigation. All three were recommended for the HO, while HO30 was also recommended for the RNE. There were an additional two sites within Boundary Bend, noted as being in Yungera, comprising Railway Station Site (HO206), at approximately 13 km southeast of the area of investigation, and Yungera Homestead (HO207), at approximately 813 m to the east of the area of investigation. HO206 was recommended for listing on the HO, while HO207 was already on the HO and was also recommended for listing on the RNE. None of these historical heritage places intersect with the current area of investigation or inundation area.
Ecological Associates Pty Ltd (2007)	Ecological Associates Pty Ltd was engaged by the Mallee CMA to undertake Stage II investigations of water management options for the Murray River from Robinvale to Wallpolla Island. One section of the assessment area intersected with the current area of investigation at the Belsar-Yungera floodplains, along Belsar and Yungera Islands. According to the report, an option was found at Carp Hole, a wetland on Belsar Island, to allow for wetland inundation of approximately 60 hectares of wetland. Another option to regulate floodwaters at Yungera Creek wetland aws also assessed. The background history of the assessment area stated that no historical archaeological investigations have been undertaken in the study region. A site inspection was undertaken across the assessment area to identify historical heritage places, focussing on the priority options sites, including Burra Creek. The site inspection aimed to inspect obtrusive historical structures, surface sites, and potential subsurface archaeological sites. No historical heritage places or areas of historical archaeological potential were identified during the site inspection, likely due to ground surface visibility being limited to 10-15 per cent across the works locations. The site inspection was limited to works areas, which mapping indicates was to be located in the northwest portion of the forest near the current area of investigation. While the mapping is not clear enough to determine the exact locations investigated, it is clear that the fieldwork did not cover the entire current area of investigation.

2.2 Historical context

2.2.1 Historical background

Non-Aboriginal settlement of the Belsar Island region first occurred after Charles Sturt's exploratory expedition along the Murray River in 1830, and Major Thomas Mitchell's Australia Felix exploration in 1836 (Bell 2013, p. 13). Although Mitchell crossed to the north side of the Murray River on 15 June of that year, to the east of the area of investigation near the confluence of the Murray and Murrumbidgee Rivers, Mitchell identified Lake Benanee to the north of the area of investigation in New South Wales (Figure 2.1).

In 1846, Alexander McCallum (also spelled as MacCallum) took up the Youngera squatting run, of approximately 57,600 acres of land, on the Murray River which could hold approximately 1,500 cattle or 10,000 sheep (Hughan Genealogy 2008; Romanov-Hughes 2013). The land encompassed Murray River frontage between land to the east of Robinvale and Boundary Bend, with its southern border stretching between the present-day location of Bannerton in the west and Yungera (West Narrung) in the east. He and his family lived at Youngera Station – according to *The Ballarat Star* (24 November 1865, p. 2), his wife died at the station at the age of 30. McCallum held the license until 1870. Youngera Station, along with the surrounding Bumbang and Mount Myall Stations, were offered for sale in 1870, but none of them were sold (*The Age*, 28 May 1870, p. 2). By 1876, both Youngera and Bumbang Stations were owned by Henry Miller (*The Argus*, 5 February 1876, p. 9).

In 1891, James Belsar moved with his family to live on Belsar Island (Belcher Island) on the former Youngera run, where he worked as a deckhand on Murray River riverboats. He received his River Steamship Master's Certificate in 1908, and later became a captain with the Murray River Steamship Company (Historical Society of Swan Hill 1908; Robinvale-Euston Visitor Centre 2019). After the riverboat trade along the Murray River ceased, he moved to Murray Downs Station, to the east of present-day Swan Hill, in New South Wales.

No townships or villages appear to have been settled within the area of investigation. In 1912, much of the Murray River frontage was tendered for sale as grazing land; the allotments within the area of investigation comprised several large swaths of land: allotments 22 (33,250 acres), 23 (21,250 acres), 24 (26,400 acres) and 25 (29,250 acres), made from part of the former Youngera run, along with parts of the former neighbouring runs of Bumbang and Mount Myall (Kenyon 1932). In 1915, Belsar Island was proclaimed a State Forest under the 1915 Forest Act. By the 1920s, all land to the north of the two creeks which flow across the area of investigation, Bonyaricall and Nargooyia Creeks, were State Forest, including both Belsar and Yungera Islands. Land to the south of these islands comprised rural allotments. A map of the Parish of Nenandie dating to 1924 shows that parts of the rural land adjacent to these creeks was subject to inundation (Butson 1924). The closest settlements to Belsar Island comprise the township of Robinvale, approximately 12 km to the northwest of the island, and the village of Bannerton is approximately 10 km to the west. The township of Boundary Bend is approximately 13 km to the east of Yungera Island. Today, much of this area is within the locality of Lake Powell. The current population is only 20 people live in Lake Powell (Australian Bureau of Statistics 2016c).

Robinvale was originally set aside for an agricultural college in the 1880s within the former Bumbang run, near the large settlement of Euston in New South Wales which was established in 1846. However, it was too remote for easy transportation (there was only a punt to Euston) and the area had unreliable access to water. As such, the land was only leased for farming in 1902. The first shopkeeper, Herbert Cuttle, took up an allotment in Robinvale (then known as Bumbang or Bumbong) in 1911, and his son (George Robin Cuttle) managed the property until he enlisted during World War I. Prior to the Great War, irrigation at Robinvale comprised that for market gardens on the river flats. A post office was opened there in 1924 as the Bumbong Post Office, which was renamed as Robinvale (named Cuttle's son) later in the same year. The Annuello to Robinvale section of the Robinvale railway line opened on 5 June 1924. After a bridge was built to replace the Euston punt in 1928, the first hotel was opened at Robinvale. Expansion around Robinvale was hampered by the Australian Dried Fruits Association, situated at Mildura, who did not want additional fruit growers entering the market. However, the opening of Lock 15 at Euston allowed for irrigation to the region. Population growth was still slow, until the 1940s when the State Rivers and Water Supply Commission lobbied for soldier settlement farms around Robinvale. While changes in government slowed the initiative, irrigation works were established in the area, and a fruit packaging cooperative was formed in 1949. By the 1980s, Robinvale supplied approximately ten per cent of Australia's dried fruit, from 300 vineyards. Market gardens, citrus orchards, and olive farms soon expanded. The township held a population of approximately 1,750 people between 1970 and 1995, and has grown since then. The town retains a hospital (1957), several schools, a secondary college (1957). It also holds recreational facilities, a hotel, a motel, two caravan parks, and several local vineyards. In 2011, approximately 40 per cent of jobs at Robinvale comprised those in the fruit and nut growing industries (Discover Murray 2020; Galletta and Henry 2018; Premier Postal Auctions 2005; VicSig 2018; Victorian Places 2015). Approximately 3,100 people live in the township of Robinvale and its surrounding districts (Australian Bureau of Statistics 2016d).

By the time the Boundary Bend Post Office opened in 1923, a school and irrigated orchards had already been established for several years; by then, Boundary Bend was already a river stop, where Robert O'Bree managed citrus and vine plantations for Mrs Alec Conner. Conner also helped to construct the school for the local children. In 1912, Captain Arch Conner purchased the Paddle Steamer *Etona*, and used her as a fishing ship at Boundary Bend. In 1922, O'Bree replaced the school, which opened on 1 March of that year as No. 4089; the Education Department opened a school there in late 1925, and No. 4089 was transferred to the new building. This township was opened for Soldier Settlement after World War I, which generated population growth in the region; prior to this, the township could not support a single shop. In 1957, the Paddle Steamer *Hero* caught fire and sank at Boundary Bend while transporting River Red Gum logs along the Murray River; the ship was raised in 1998, and transported to Echuca for restoration. The post office closed in 1994 (Dean n.d.; Echuca Moama 2020; Mallee CMA 2015; Premier Postal Auctions 2005). The locality of Boundary Bend now has a total population of approximately 130 people (Australian Bureau of Statistics 2016b).

Bannerton was originally a township settled by soldier-settlers during the Soldier Settlement era. One of its earliest stores at Bannerton, which was the only extant building associated with Bannerton in 2001, was established in 1926 and run by Richard Fitzgerald from 1927 until 1964. The post office opened in Bannerton in 1924 as Banner Post Office. It was soon renamed to the Tol Tol Post Office later in 1924, before being changed to Bannerton in 1926. The post office closed in 1974. Bannerton once also had a school, which has since been demolished, after the failure of this Soldier Settlement township (Allom Lovell and Associates 2001b; Premier Postal Auctions 2005). The locality of Bannerton has a total of 40 people (Australian Bureau of Statistics 2016a).

Today, much of the area of investigation comprises River Murray Reserve, with Belsar and Yungera Islands proposed to become Murray River Park, and are within a public conservation and resource zone. The proposed Murray River Park was the results of an investigation by the Victorian Environmental Assessment Council into the state of Victoria's River Red Gum forests, and intends to protect and unify an important habitat corridor of River Red Gum forests along the Murray River (Parks Victoria 2018). Lakes Powell and Carpul also a public conservation and resource zone. The remainder of the area comprises rural allotments within farm zones.

The area of investigation on the Belsar and Yungera Islands floodplain likely to have been impacted by pastoralism, logging activities, drainage construction, and tourism (Cusak 2000).

2.2.2 Historical maps and aerial imagery review

An 1838 map shows Major Thomas Mitchell's Australia Felix exploration of the region in 1836. However, Mitchell followed the Murray River to the north of the area of investigation, and as such, only lakes and waterways to the north of Belsar and Yungera Islands, such as Lake Benanee, were surveyed (Figure 2.1).

In 1851, the assistant surveyor's map of the Murray River at Belsar Island (which was not a named island at the time) shows the present-day project and inundation areas as comprising polygonum swamps, box flats, gum forests, scrubby box forests, eucalypts, Mallee scrub, pines, high gum timber, open salt bush, and sand hills. Belsar Island was described as, 'covered with Box Timber Polygonum Scrub Swampy ground and Flooded Gum Flat Bad soil'. Narcooyia and Bonyaricall Creeks were also marked on the map.

There was also a landing place for stock crossing of the Murray River marked on the map, situated at the project's eastern end, which comprised a box forest in the north. Two roadways were extant, crossing through the area of investigation – the 'Road to McCallum's Wooldshed' and the longer 'Road from McCallum's to Grant's'. There were several structures noted within proximity to the area of investigation – McCallum's Woolshed, near the centre of the area of investigation and appears to have been located approximately 470 m north just north of Narcooyia Creek and Cattle Yard Track; and McCallum's Hut to the northwest of the woolshed, which appears to have been between River Track and the Murray River and therefore it was likely to be adjacent to the area of assessment. McCallum's homestead was immediately to the east of the stock crossing, and comprises Yungera Homestead (HO207) (Figure 2.2).

The presence of McCallum's hut and woolshed, and the stock crossing area, shows that this part of the Murray River frontage was used for pastoral purposes at the time, related to Youngera Station.

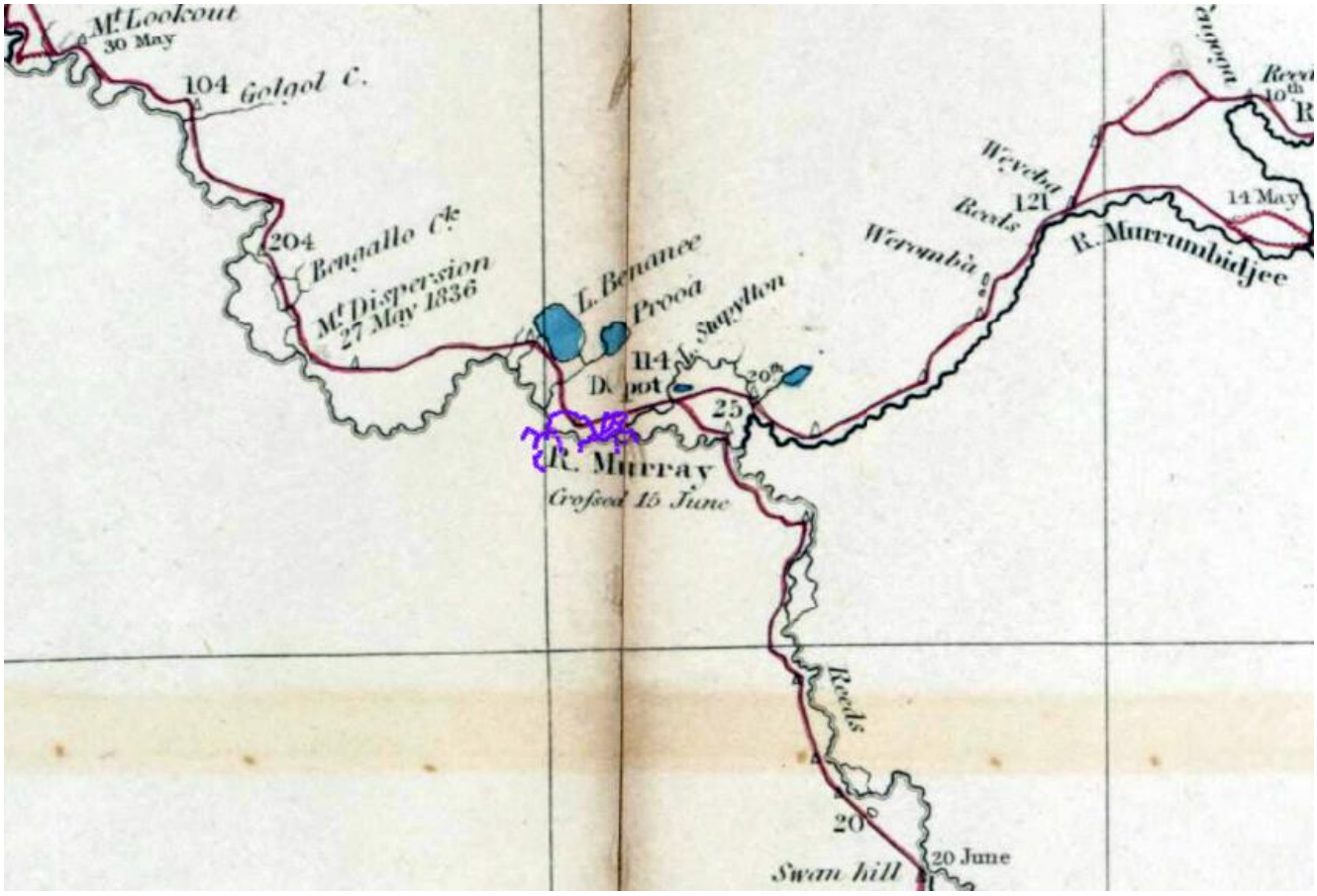

Figure 2.1: Expedition map near Swan Hill, with approximate area of investigation in purple (Mitchell 1838)

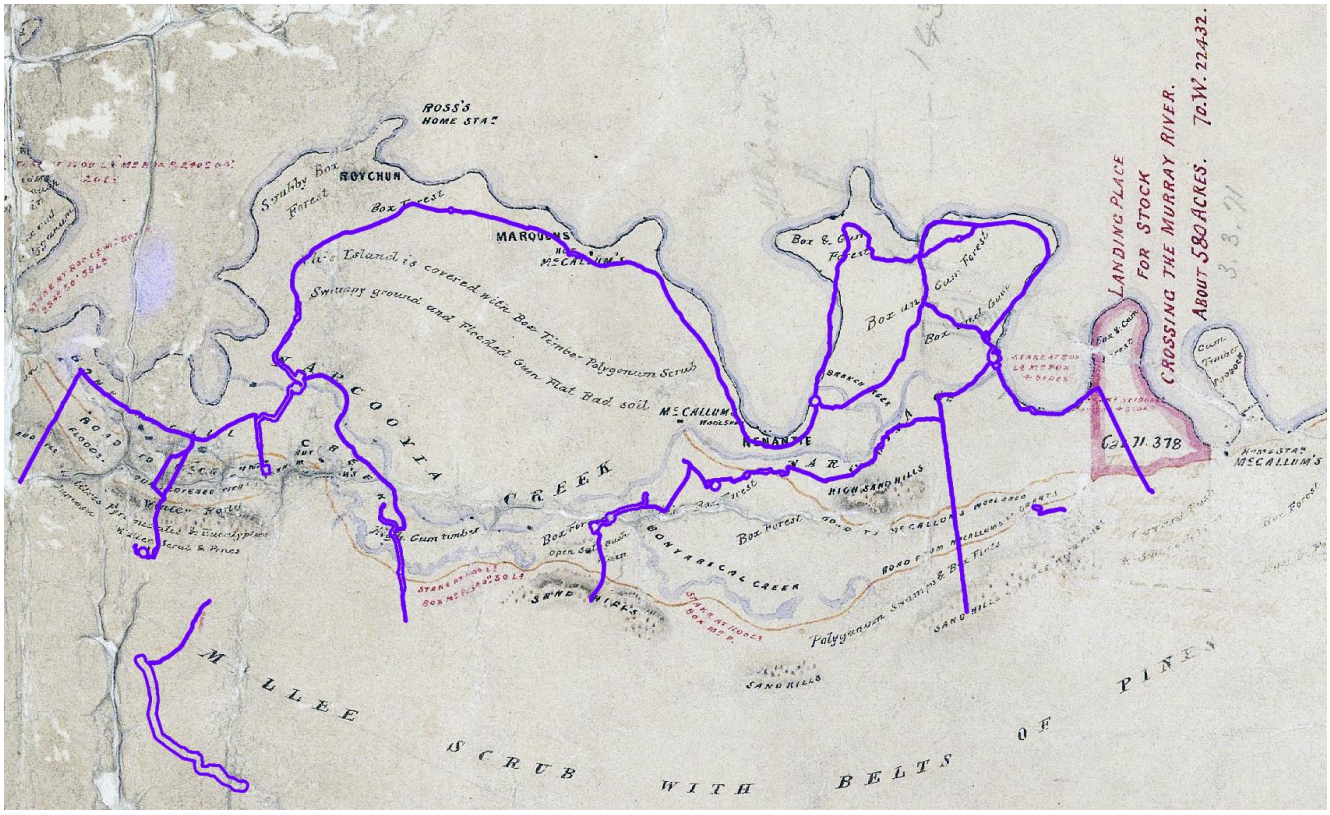

Figure 2.2: Surveyor's map at Nenantie, with approximate area of investigation location in purple (Prichard 1851)

The County of Karkarooc and County of Tatchera maps from 1884 show that there were no townships extant along the Murray River near the area of investigation. Both the 1851 and 1884 maps show the locations of Narcooyia and Bonyaricall Creeks, and roadways in the area. There are no structures on the maps (Figure 2.3).

Figure 2.3: 1884 Karkarooc and Tatchera county maps, with approximate location of the area of investigation outlined in purple (Department of Lands and Survey 1884a; 1884b)

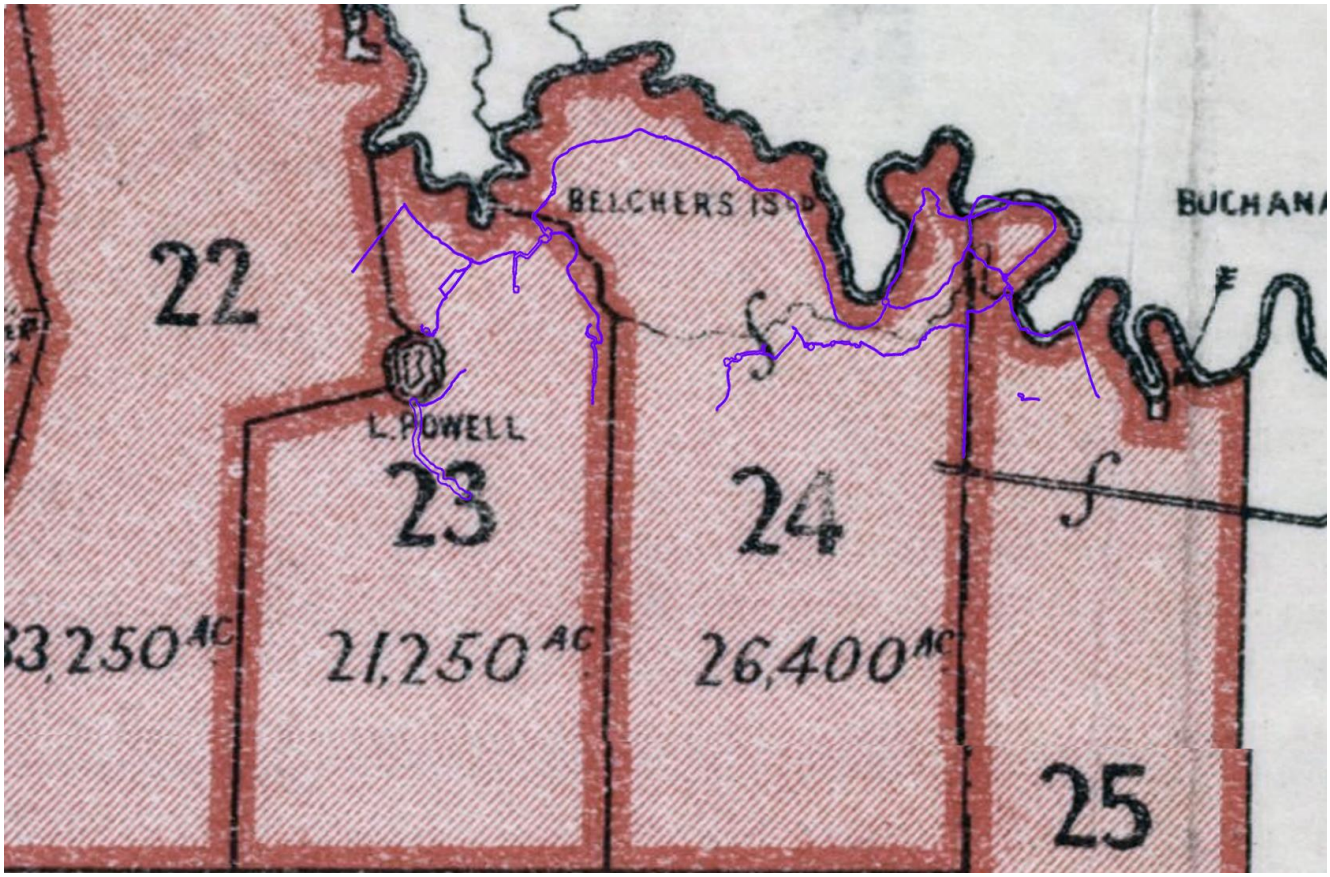

Figure 2.4: 1912 Grazing Blocks Murray River Frontages tender map, with approximate location of the area of investigation outlined in purple (Butson 1912)

A 1912 map of Murray River frontage grazing blocks shows that the area of investigation intersected with two large allotments used for grazing: allotments 23, 23, 24 and 25. Both Belsar Island ('Belchers Island') and Lake Powell are shown on the map. While there are no structures mapped within proximity to the area of investigation, a roadway is apparent near 'Buchanan', which seems to point to an excised piece of land at the location of McCallum's homestead (Figure 2.4).

Surveyed allotments were included on the 1924 Karkarooc and 1920 Tatchera county maps, which shows that the old roadways had changed alignments, with additional roadways added, and that Belsar Island (then called 'Belchers Island') and Yungera Islands were also all marked on the map. While Tatchera map does not number its allotments, those in Karkarooc County that intersect with the area of investigation comprise: the roadway between allotments 11 and 3, 4 and 6A, and adjacent to 9C, along with allotments 3A, 4, 4B, 7A, 8C, 8D, 8E and 9D. There are no allotments marked on either Belsar or Yiungera Islands or between Lake Powell and 'Lake Carpal' (Lake Carpul), as these allotments are all to the south of Bonyaricall and Narcooyia Creeks (Figure 2.5).

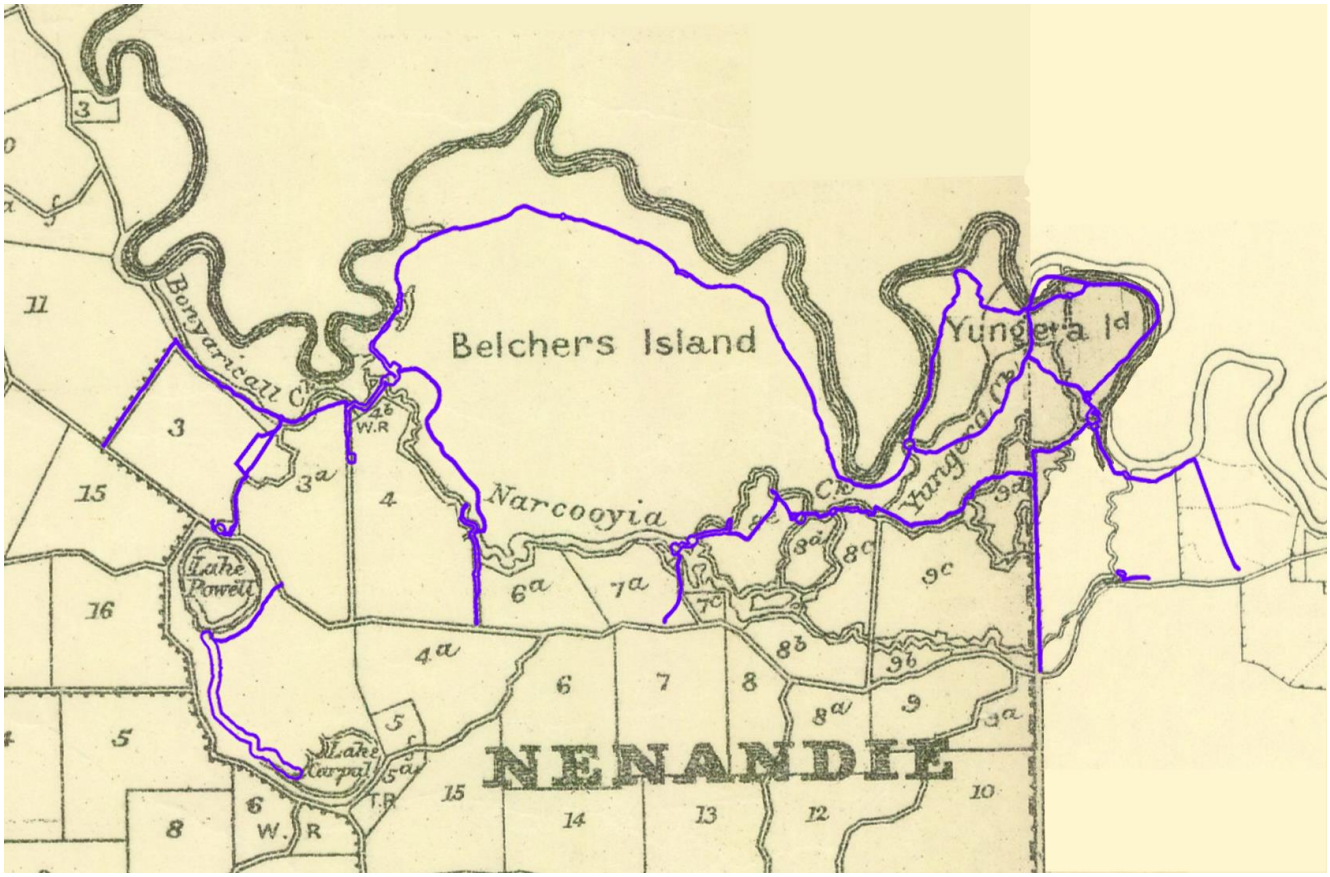

Figure 2.5: 1924 Karkarooc and 1920 Tatchera county maps, with approximate location of the area of investigation outlined in purple (Butson 1924; Department of Lands and Survey 1920)

However, maps of the Parishes of Nenandie (1925) and Yungera (1923) show allotment numbers, and names of the original owners of the allotments (Figure 2.6). In Nenandie, allotments 3 and 3A were originally owned by A McPhee, although subsequent annotations show D Taylor as the latest owner; 3B and 3D was owned originally by AE Thomson before 3B became a wildlife reserve; allotment 4 was originally owned by RK Patterson, with the latest owner being C Bailie; allotment 6A was owned by W McGinty, and later AM Berg; allotment 7A by C Murphy, then later FJ Stacpoole; Allotments 8C, 8D and 8E by RG Patterson, then subsequently AM Berg; and allotment 9D (then renamed as allotment 29) first owned by JK Anderson. Within Yungera, the allotments that intersect or are adjacent to the area of investigation (1, 1A, 1B, 1C and 1D) were all originally owned by A. A. Paul. Land to the north of Bonyaricall Creek is noted as State Forest, as was that to the north of Narcooyia Creek ('Belcher's Island' and Yungera Island).

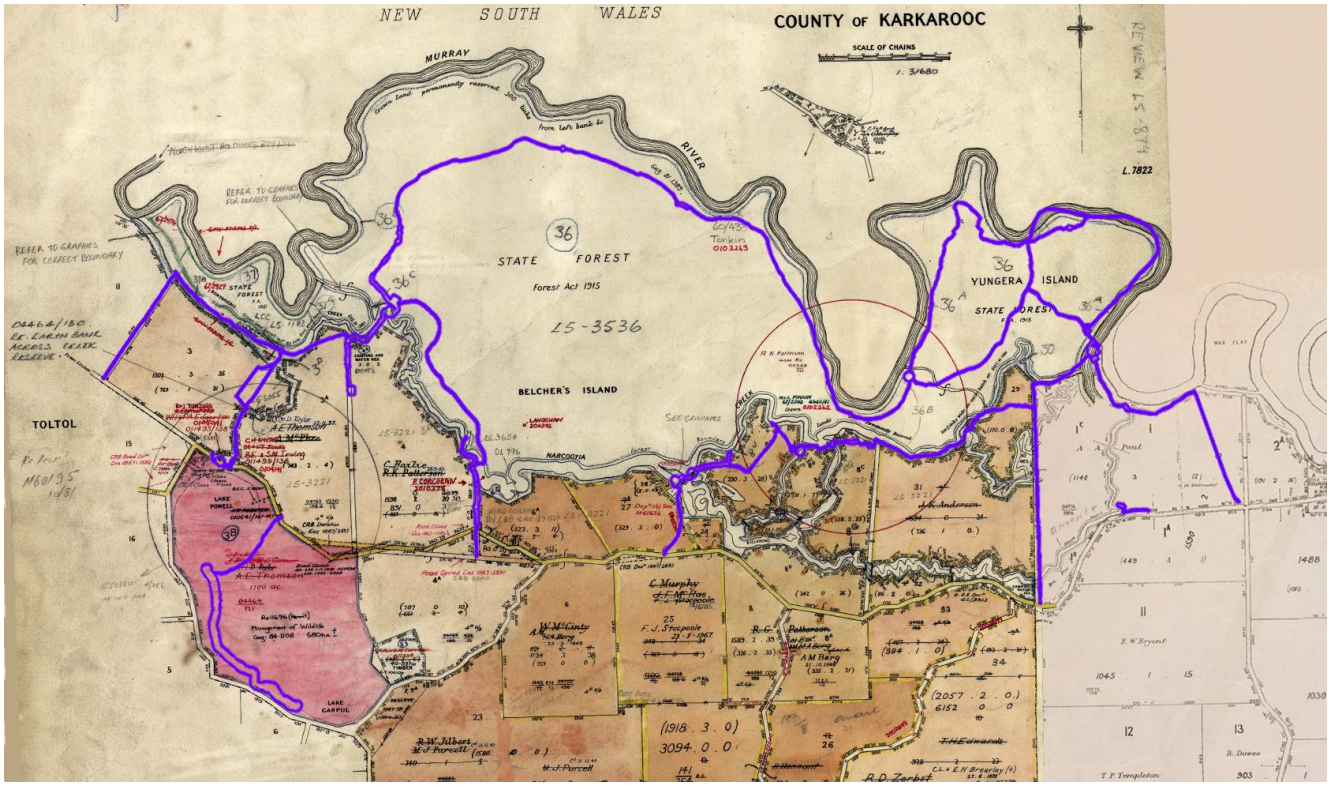

Figure 2.6: Parishes of Nenandie (1925) and Yungera (1923) showing allotments and approximate location of the area of investigation (Butson 1923; 1925)

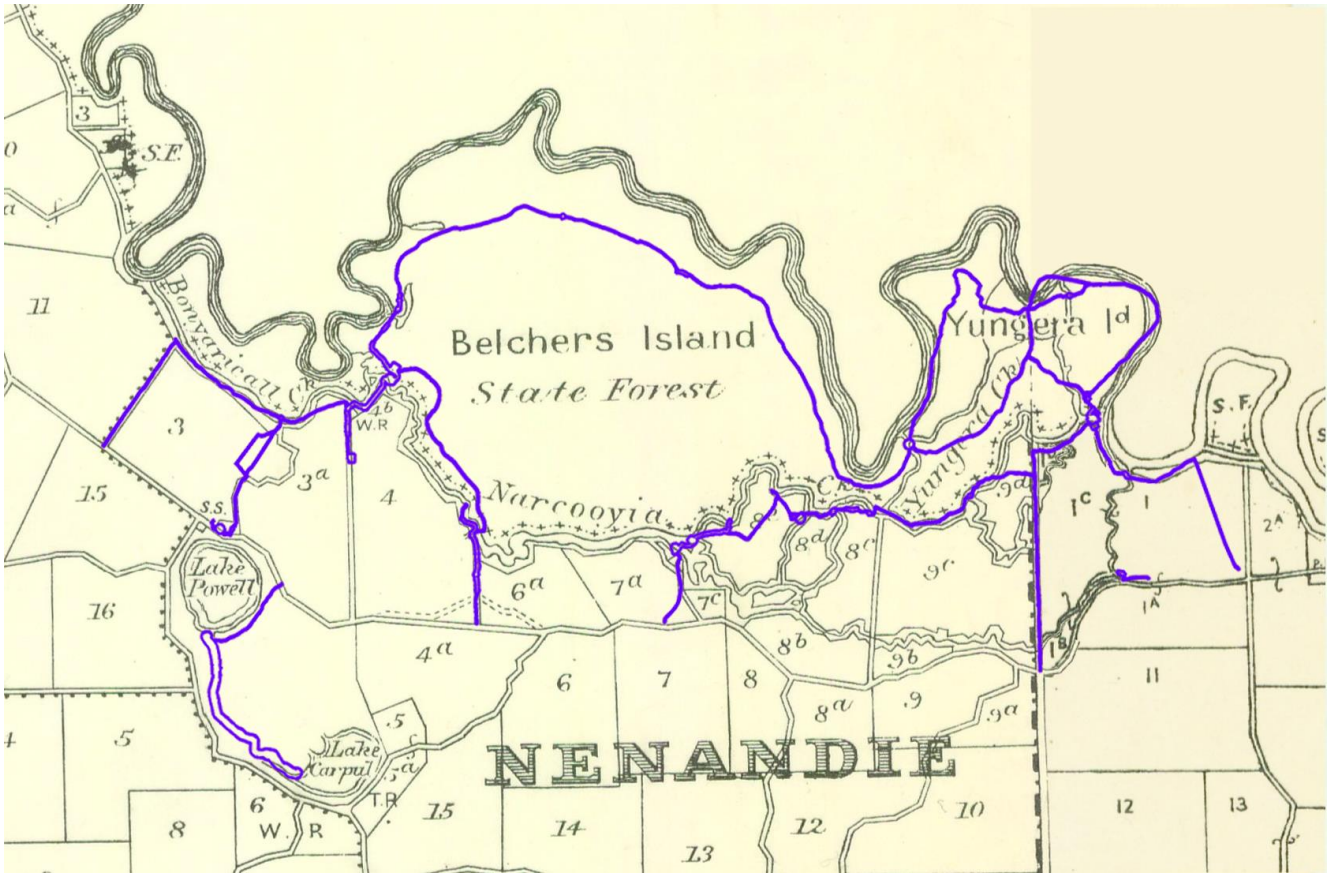

Figure 2.7: 1958 Karkarooc and 1953 Tatchera county maps, with approximate location of the area of investigation outlined in purple (Department of Lands and Survey 1953; 1958)

There is little difference between the 1958 County of Karkarooc map and that from 1924, except that the land adjacent to the Murray River has been delineated as State Forest, while the 1953 County of Tatchera map shows allotment numbers, 'Lake Carpal' has been renamed to Lake Carpul, and that land to the northeast of the area of investigation was, by then, State Forest (Figure 2.7).

Aerial imagery from 1945 shows that the northern section of the area of investigation, to the north of Bonyaricall and Narcooyia Creeks, as a tree-covered area with open wetlands, with several access tracks visible. Land to the south of these creeks typically comprises roadways and rural allotments, excepting that around Lakes Powell and Carpul. While several structures are visible in the aerial imagery, no obvious structures appear to be within the area of investigation. There may have been bridges present where tracks cross creeks and other waterways (Figure 2.8).

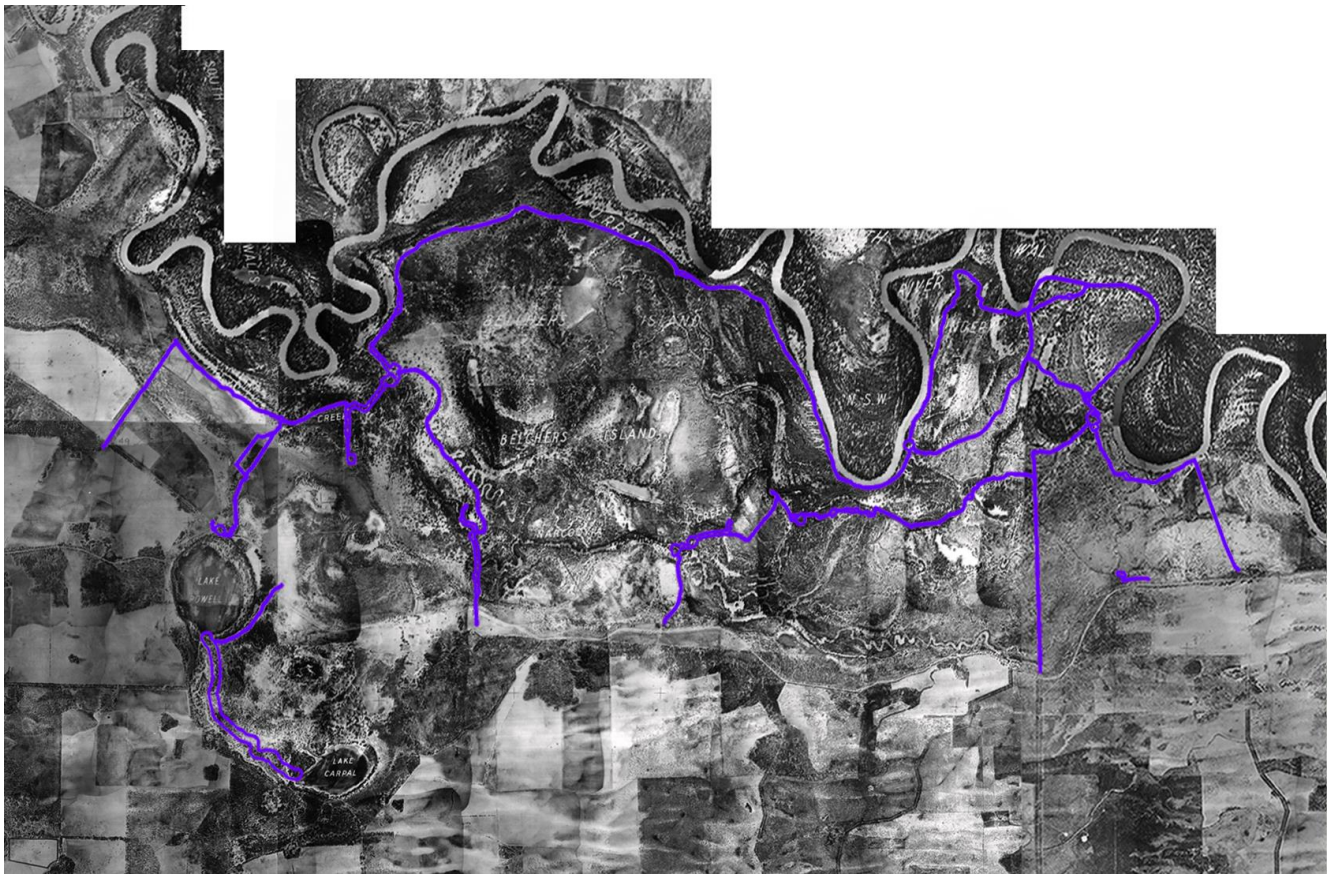

Figure 2.8: 1945 aerial imagery with approximate location of the area of investigation outlined in purple (Aerial Survey of Victoria 1945a; 1945b; 1945c; 1945d; 1945e)

Today, modern aerial imagery shows that there is a definite divide between the rural landscape to the south of the Murray Valley Highway, excepting some sections of farmland to the north of the highway and the land between Lakes Powell and Carpul to the south of the highway. Land to the north of the highway is typically comprised of tree-covered swamps and wetlands the north of Bonyaricall and Narcooyia Creeks, and tree-covered or shrubby plains. The area of investigation, however, typically follows extant roadways and access tracks, except in locations where construction is to take place. While there are buildings adjacent to some of the roadways within the rural sections of the area of investigation, no structures appear to be present amongst the medium-to-dense tree cover found across the area of investigation.

2.3 Predictive statement

Following a search of the above registers, review of the previous literature and analysis of relevant reports, the following predictive statements can be made in relation to the area of investigation and the inundation area:

- The most likely site type in the area of investigation would be archaeological sites associated with early agricultural or pastoral activities and water management practices
- There is moderate potential for previously unidentified historical heritage to be present within the area of investigation, due to the possibility of structures on Belsar Island within, or close to, the area of investigation as per the 1851 survey map, and possible pastoral or rural heritage places associated with the rural allotments that intersect with the area of investigation.

2.4 Summary of desktop findings

There are no listed historical heritage places that intersect with the area of investigation or the inundation area. Examination of the *Rural City of Swan Hill Heritage Study Stage II* in combination with a review of the parish maps and aerial imagery review has not identified any potential historical heritage places or archaeological sites within the project or inundation areas.

There is moderate potential for previously unidentified historical heritage (mainly archaeological sites) items to be present within the area of investigation and the inundation area, from the background history of the area. Site types most likely to be identified in the area of investigation and the inundation area would be heritage places or archaeological sites associated with early agricultural or pastoral activities and water management practices.

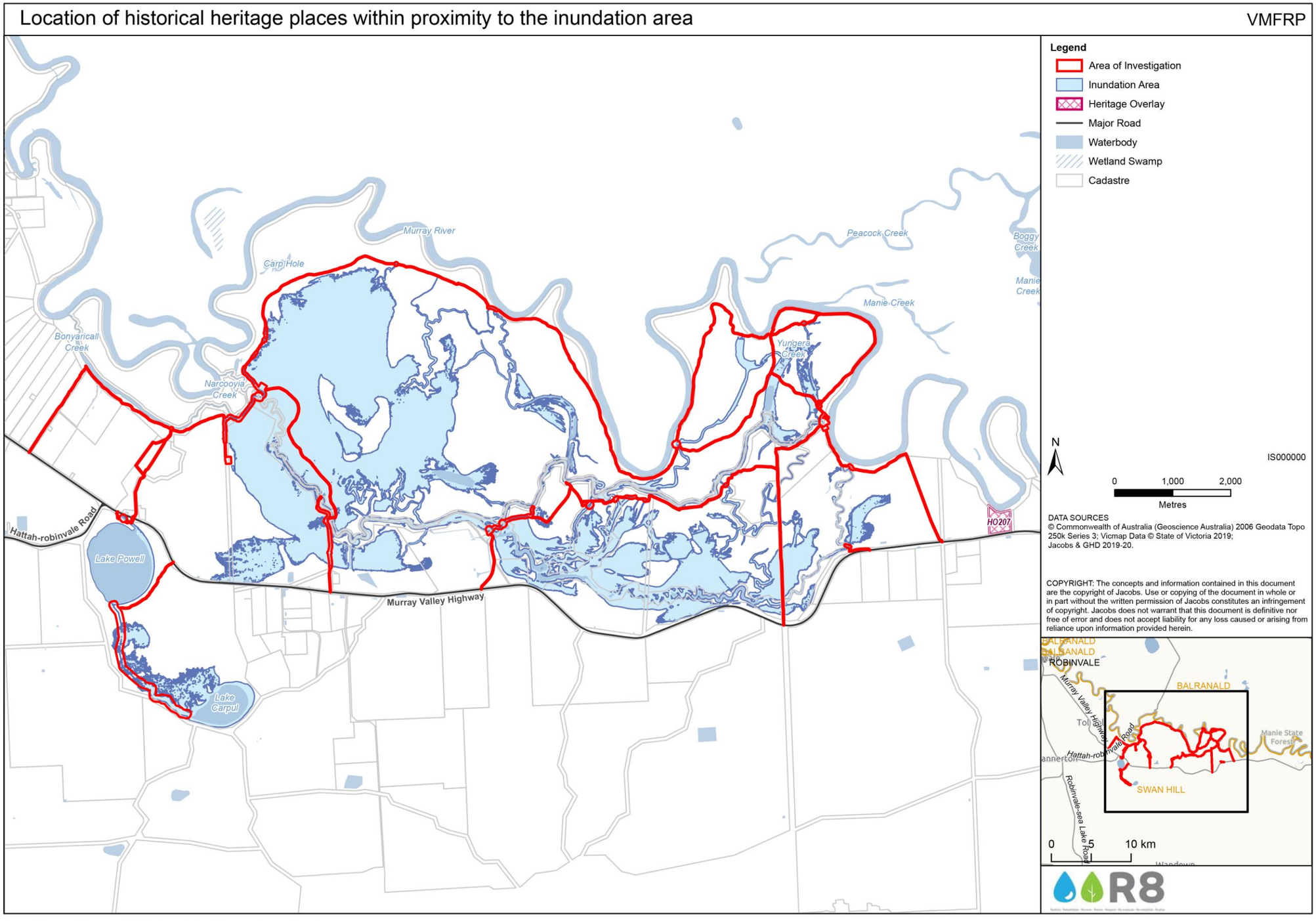

Figure 2.9: Location of historical heritage places within proximity to the area of investigation and inundation area

3. Impact assessment

3.1 Proposed works

3.1.1 Main works

The Belsar-Yungera Floodplain Restoration Project is located on the Murray River floodplain, approximately 30 km upstream of the Euston weir, near Robinvale in north-west Victoria. The project is designed to facilitate managed inundation by isolating a large section of Narcooyia Creek and Yungera Creek from the Murray River, enabling these creeks to hold a water level of 52.3 m AHD. This is expected to be achieved through either the capture of a natural flooding event, pumping into the creek system over a period of time, or pumping into the creek system on top of a natural flooding event, extending the natural event in size and duration.

There are four distinct environmental works areas for the project including:

- Area 1 – Primary inundation area. Inundation to level of 52.3 m AHD using three large environmental regulators and eight supporting regulators and containment banks to provide an inundation area of approximately 1,539.71 ha.
- Area 2 – Lower J1 Creek area. Inundation to level of 52.9 m AHD using two environmental regulators and four supporting regulators and containment banks to provide an inundation are of approximately 526.24 ha.
- Area 3 – Upper J1 Creek area. Inundation to level of 53.3 m AHD using one environmental regulator and one supporting inflow structure to provide an inundation area of approximately 35.96 ha.
- Area 4 – Lake Powel and Lake Carpul Area. Inundation to level of 52.6 m AHD via two environmental regulators, a permanent pipeline and temporary pumping installation to provide an inundation area of approximately 272.19 ha.

The project involves the construction of three new large regulators (ER1, ER3 and S7), a fishway at ER1, a number of small regulators and a series of containment banks to divert, retain and release water within the floodplain and two pipelines and associated hardstands to enable temporary pumping that will transfer environmental water from the Murray River into the Narcooyia Creek system.

Specifically, the proposed works include:

Area 1: Primary Inundation Area

- Three main regulator structures (ER1, ER3 and S7) are used to isolate a large portion of Narcooyia Creek and Yungera Creek from the Murray River to manage breakout areas. A vertical slot fishway will be constructed at Regular ER1.
- Seven small regulator structures (ER1 South, ER1 North, S4, S105, S5, S108, S109) in Area 1 to enable smaller breakouts to be contained within the system. These minor regulators will be operated in either a fully opened or fully closed position, with all works designed to minimise the impact on the distribution of natural flood flows.
- Realignment and extension of irrigator pipeline which discharges water into Narcooyia Creek after the ER3 regulator is constructed.
- A series of containment banks to enable water to be held at the design inundation level.
- A permanent pump hard stand and a permanent underground pipeline from the hard stand to the downstream side of ER3 to facilitate the pumping of environmental water from the Murray River into the system. Temporary pump infrastructure will include a trailer-mounted rig with a suction pipe extending into the Murray River, which would be brought onto site as required.
- Potential removal of the existing block bank at the entrance of Narcooyia Creek and the waterway reshaped to enable the ER3 Regulator to be the control point for inflows.

Area 2: Lower J1 Creek area

- Two small regulators (J1a 1 and 2) on the downstream end of J1 creek, primary purpose to retain water within Inundation Area 2 and regulating passing flows through the system from Inundation Area 2 to Inundation Area 1.
- Four small regulators (J1b, J1d, J1e, J1f) included in containment banks that are required to prevent water flowing out through secondary flood runners, to contain water in Area 2 and allow for inflows from Narcooyia Creek in flood events.
- A series of containment banks to enable water to be held at the design inundation level.

Area 3: Upper J1 Creek area

- Two small regulators (J1c and J1g) included in containments banks to allow for the inundation and containment of water in Area 3, release of water to Area 2 and allow flood flows through the system.
- A hard stand for a temporary pump arrangement provides a secondary location for delivering water from the Murray River to all four inundation areas identified in this project. The hardstand will be located at the site previously used by the Mallee Catchment Management Authority (MCMA) for pumping in the past. There are no pipes or other assets at this site. Temporary pump infrastructure will include a trailer-mounted rig with a suction pipe extending into the Murray River, which would be brought onto site as required.

Area 4: Lake Powell and Lake Carpul

- A 1.8 km long pipeline will be constructed between Bonyaricall Creek and Lake Powell. The pipeline, together with a temporary pump installation, provides the ability to inundate Lake Powell and Lake Carpul.
- A small regulator (Lake Powell) will be located on the southern side of the Murray Valley Highway to hold water to the design inundation level.
- A new culvert will be installed across the Murray Valley Highway to increase the flow capacity at this location, improving the ability for natural flood flows to enter and exit the lakes at a lower commence to flow level.
- A small regulator (Lake Carpul) will be constructed south of Lake Powell within the cutting to improve hydraulic connectivity between Lake Powell and Lake Carpul and prevent Lake Carpul being drawn down too quickly following an environmental watering event.

Containment banks of approximately 2.7 km in Area 1, 1.4 km in Area 2, 0.2 km in Area 3 and 0.7 km in Area 4 will also be constructed by raising existing access tracks to enable water to be held to the design level. Seven spillways, each 20 m in length, will be incorporated into the construction of the small regulators and containment banks. They will include rock beaching with concrete sills and will be trafficable. Access track dimensions on containment bank crests are still to be confirmed in consultation with Parks Victoria but would generally be consistent with Parks Victoria access track design and maintenance guidelines. For containment bank / access tracks, The construction footprint provides for a 5 m wide corridor along existing access tracks to carry out maintenance works.

The project may also include the decommissioning of the existing regulator on Narcooyia Creek and upgrade to existing access to the structure. The footprint of the existing structure has been included in the Construction Footprint as the location is known, however the potential access track to be used if decommissioning is required has only been included in the Area of Investigation due to the access plan for this decommissioning works yet to be confirmed. The requirement for decommissioning of this structure and associated access would be confirmed as the project progresses.

A channel between Lake Powell and Lake Carpul is also currently being investigated as part of the design process, the requirement of this channel will be confirmed in later stages of the design process for the project. Given the uncertainty around the requirement for this channel, it has not been included in the proposed area of impact (i.e. Construction Footprint) however has been included in the Area of Investigation for the project for completeness.

A summary of the design specifications for each of the regulators is presented in Table 3.1.

Table 3.1: Summary of regulator design specifications

Regulator	Open/Close or regulate flow	Proposed design	Proposed gates
ER1	Regulate	7 No. 2000W x 6500H 1 No. 1000W x 6500H (adj. fishway) 1 No. 2000W x 3950H	Split leaf gates
ER3	Open/close	6 No. 2000W x 4300H 1 No. 2000W x 3950H	Split leaf gates
S7	Open/close	6 No. 2000W x 3000H	Split leaf gates
J1a (1) (2)	Open/ close	4 No. 1800W x 2100H	Penstock
J1b	Open/ close	2 No. 1200W x 1000H	Penstock
J1d	Open/ close	2 No. 1800W x 1950H	Penstock
J1e	Open/ close	2 No. 1200W x 1350H	Penstock
J1f	Open/ close	2 No. 1200W x 700H	Penstock
J1c	Open/ close	3 No. 1200W x 1050H	Penstock
J1g	Open/Close	1 No.1800W x 1200H & 1 No. 1200W x 1200Hx	Penstock (Downstream) Bulkhead (Upstream)
Lake Powell Regulator	Open/ close	5 No. 1800W x 1800H	Penstock
Lake Carpul Regulator	Open/ close	1 No. 1800W x 100H	Penstock

The following design philosophy has been applied:

- The regulating structures are designed to allow natural flows to pass unhindered, to and from the floodplain when the structures are not in use (fully open).
- The arrangement of regulating structures, containment banks and overflow spillways have been developed to minimise the potential for erosion over the whole range of flow conditions.
- The regulating structures are designed to provide fish passage when not in use (fully open).

3.1.1.1 Temporary pumping infrastructure

Permanent pump infrastructure is not included in the design. However, a pump hardstand area is proposed at the upstream side of Regulator ER3, located on the River Murray to enable the setup of temporary pumping infrastructure to deliver environmental water into Narcooyia Creek. A permanent pipeline will be installed between the hard stand and the ER3 regulator. The permanent pipeline will be located immediately adjacent to the realigned irrigation pipeline and has peak flow of 200 ML/d and a maximum velocity of 2 m/s, comprising a single 1,200 mm diameter pipe.

A pump hardstand area is also proposed in inundation Area 3, to transfer water from the Murray River. The new hardstand will be located at the site previously used by Mallee CMA for pumping in the past. There are no pipes or other assets at this site. The temporary pumps set up at this location will pump to J1g, where the pipeline will connect to a bulkhead slotted into the headwall of the structure to provide connection through to Area 3.

A hardstand area for a temporary pump installation will be also be created on Bonyaricall Creek for delivery of water to Lake Powell, which can be accessed from the track providing access to Regulator ER1. The hard stand will comprise a gravelled surface, which is adjacent to the pipeline inlet arrangement. The hard stand will be located on Crown Land.

Temporary pump infrastructure would include a trailer-mounted rig with a suction pipe extending into Bonyaricall Creek. While the frequency and duration of pumping would depend on actual inundation events and the method to achieve environmental watering targets, it is expected that pumping may be needed at least two years in every 10 years, for a period of several weeks.

3.1.1.2 Fish passage

Explicit fish passage is planned to be provided at the proposed ER1 regulator at the downstream end of Area 1. The fish passage provision at ER1 is a vertical slot fishway (up to 4.3 m head difference, with 40 pools). No fishways are proposed at ER3 and S7 large regulators however, passive fish passage has been provided when the gates are open.

The design of all other regulators allows for movement of fish directly through the regulator structure. Small regulator structures will be operated either in fully open or fully closed position. When water is released with the regulator gate in fully open position, fish have passage through the regulator both in managed release and natural flood scenarios. Structures have been designed to have flow velocities appropriate for fish passage.

Water will generally enter the upper reaches of Narcooyia Creek under pumped conditions and so the potential for fish passage under these conditions is low. Under natural flooding conditions there will be unobstructed access for fish across all regulators (as they will be fully open in large floods).

3.1.1.3 Maintenance

Maintenance will need to be undertaken to existing access tracks to ensure they are suitable for use during construction and operation. This would involve grading and applying additional road base to the surface.

3.1.1.4 Borrow pits/quarry sites

Construction of the project would require the import of material (clay/rock). VMFRP is in the process of identifying possible borrow pits to acquire this material, with the objective of selecting locations as close as possible to the project, on private land outside of Belar and Yungera Islands, while also avoiding and minimising impacts. Once the locations are confirmed, the permits and approvals required for establishing new quarry/borrow sites or expanding existing sites will be sought.

3.1.2 Key construction activities

Construction activities would occur within the area identified in Figure 1.1-Figure 1.8. Construction activities would include:

- Establishment of construction sites, including removal of vegetation, stripping and stockpiling of topsoil, establishing temporary parking and truck turnaround areas, laydown and stockpiling areas
- Removal of existing structures / block banks where required
- Construction / installation of new structures.

Construction would involve use of vehicles and machinery such as trucks, excavators, and access equipment.

Importation of construction materials, including regulators and imported soils, would comply with Parks Victoria consent under Section 27 of the *National Parks Act 1975* and the future *Environment Protection Act 2017* (due to commence on 1 July 2020).

An Environmental Management Plan (EMP) would be prepared for the works and would detail the measures to avoid and minimise impacts during construction. Once construction of regulators, stop banks and all associated works are complete, all waste and spoil will be removed from the sites and disposed of as required by the EMP.

3.1.2.1 Construction in the Murray River

There will be no construction of works within the Murray River. There is potential for decommissioning works in the Murray River associated with the block bank on Narcooyia Creek that separates the creek from the River.

3.1.2.2 Construction laydown areas

The investigation area (proposed construction footprint) includes a working area (approx. 20 m) around the development footprint for proposed infrastructure to accommodate movement of vehicles and machinery and some limited storage of equipment and materials.

Construction laydown areas are proposed as follows:

- ER1 – Located to the north east of ER1
- ER3 – Located to the South west of ER3.

These two sites have been selected to provide the primary location for site offices, vehicle parking, storage of equipment and materials, etc. Within each other site, more localised laydown areas will be required.

3.1.2.3 Site rehabilitation

Following completion of works, rehabilitation of construction areas would be undertaken in accordance with Parks Victoria consent under Section 27 of the *National Parks Act 1975*. General principles for site rehabilitation include:

- Use of local indigenous plant species
- Placement of habitat logs
- Retention and reuse of topsoil
- Rock beaching using materials consistent with the local geological settings, where practicable.

3.2 Potential impacts

3.2.1 Proposed works

There are no registered historical heritage places that intersect with the area of investigation. As such, the proposed works (Section 3.1) will not impact upon any known historical heritage places.

3.2.2 Inundation area

There are no registered historical heritage places that intersect with the inundation area. As such, the proposed inundation area (Section 3.1.1) will not impact upon any known historical heritage places.

There is moderate potential for previously unidentified historical heritage items or archaeological sites to be present within the area of investigation and the inundation area, based on the background history of the area. Site types most likely to be identified would be heritage places or archaeological sites associated with early agricultural or pastoral activities and water management practices.

4. Approval requirements

The approvals requirements for potential archaeological sites within the area of investigation is provided in Table 4.1.

If the scope of works changes, this heritage assessment will need to be updated.

Table 4.1: Statutory requirements for heritage within the area of investigation

Project element	Statutory requirements
Entire area of investigation	Discovery of archaeological sites - under Section 127 of the *Heritage Act 2017*, If an archaeological site is discovered during construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to HV.

5. Historical heritage recommendations

5.1 Recommendations and project risk

Whilst there are no registered historical heritage places that intersect with either the area of investigation and inundation area, there is moderate potential for previously unidentified historical heritage items or archaeological sites to be present within these areas. Therefore, due to the possibility for unidentified historic archaeology to be impacted, it is recommended that a Historical Heritage Assessment (HHA) be undertaken for the project.

This should include a field survey within the area of investigation to identify further historical archaeological sites and any unidentified historical heritage places, and a significance assessment of these potential historical places.

If any historical heritage items or archaeological sites are identified as part of the HHA, a Heritage Impact Assessment (HIA) would be required:

- Assessment of impacts on all historical heritage sites
- Detailed identification of mitigation measures and approval requirements
- A Heritage Impact Statement.

All historical archaeological places are protected under the *Heritage Act 2017*, whether they are registered or not.

Undertaking a field survey to ascertain the likely presence of any historical archaeological places or material within the area of investigation is recommended to reduce the risk of delays to the project. Such delays would include the stoppage of works to avoid damage or destruction of historical archaeological sites and materials while the appropriate approvals are sought.

The completion of the HIA for the project would mitigate these issues.

6. Mitigation measures

High level mitigation measures may apply to the project, and are outlined in Table 6.1. These can be confirmed after the HIA.

Table 6.1: Proposed project activities and specific management measures for the heritage places within the area of investigation

Proposed activities	Project element	Mitigation measures
General activities	Entire area of investigation	General mitigation measures to be implemented across the area of investigation: ▪ Historical heritage awareness training should be completed as part of the site induction for all personnel and/or contractors prior to the commencement of construction works to ensure: - an understanding of where all heritage places are located within the area of investigation - an understanding of the potential heritage places that may be impacted during the project - the procedures required to be undertaken in the event of discovery of historical heritage material, features or deposits, or the discovery of human remains ▪ If an archaeological site is discovered during construction or excavation on any land, the person in charge of the construction or excavation must as soon as practicable report the discovery to HV ▪ A copy of this report should be kept onsite and on file with the project records. All contractors and/or project staff should be made aware of the heritage status of the heritage places in the area of investigation prior to works taking place.

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