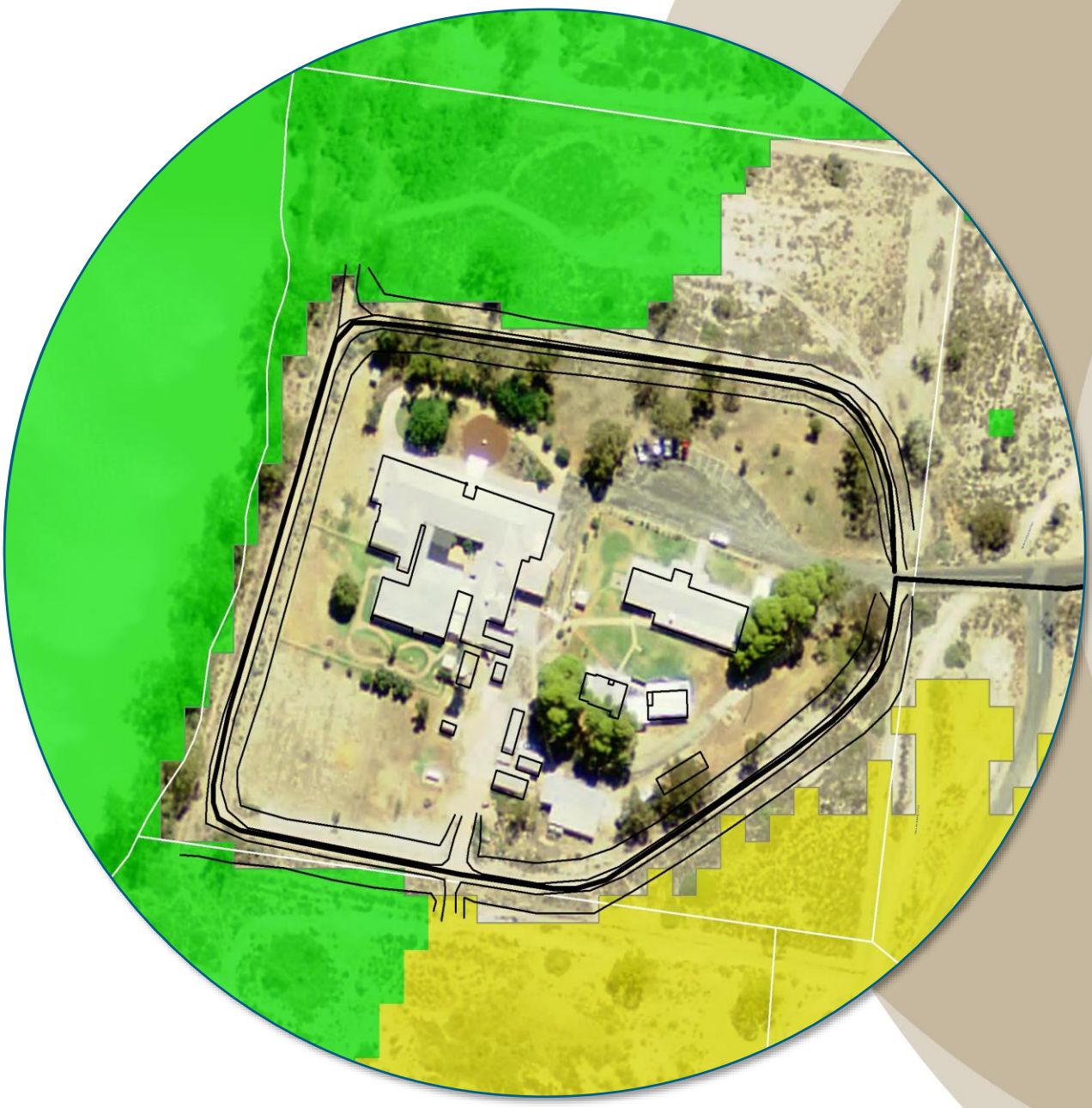

Wentworth Hospital Redevelopment

Flood Impact and Risk Assessment

Health Infrastructure

May 2023

rp311015-00304rg_wjh230503-Wentworth Hospital Redevelopment FIRA

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Project: Wentworth Hospital Redevelopment
Flood Impact and Risk Assessment

Rev	Description	Author	Review	Advisian Approval	Date
A	**Draft Report for internal review**	RG R Golaszewski	WH W Honour		20-12-22
B	**Final Draft for Client Review**	RG R Golaszewski	WH W Honour	CRT Chris Thomas	31-01-23
C	**Updated Final Draft**	RG R Golaszewski	WH W Honour	CRT Chris Thomas	24-02-23
D	**Final Report**	RG R Golaszewski	WH W Honour	 Chris Thomas	03-05-23

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Appendices

1 Introduction

The Wentworth Health Service Redevelopment is a $30m project located in the Far West region of NSW close to the Victorian border. The project will include full asset replacement of the existing health service's ageing buildings and infrastructure, along with additional health services in line with contemporary models of care and the ongoing needs of the local area.

Out of three shortlisted sites explored during the master plan phase, the existing hospital site at 24 Hospital Road, Wentworth, is the preferred site and was endorsed by the governance during the master plan phase. The location of the hospital relative to Wentworth Town, Mildura and the Murray and Darling Rivers is shown in **Figure 1**.

As shown in **Figure 1**, the hospital is situated on the eastern bank of the Darling River about 800 m upstream of its confluence with the Murray River. The hospital is protected from flooding in most events by an existing earthen levee that forms a ring around the site. The preferred location for the proposed redevelopment of the hospital is on the same site and inside the ring levee.

Investigations undertaken as part of the '*Wentworth Flood Study*' (*Rev D – Final Draft, July 2021*) determined that floodwaters are predicted to surround the ring levee during a 1% Annual Exceedance Probability (AEP) event. Although the existing levee is not predicted to be overtopped in an event of this magnitude, all road access to flood free land would be cut during events exceeding a 5% AEP flood.

In recognition of the flood risks to the existing and proposed hospital a preliminary flood assessment was completed in August 2022 to confirm flood conditions at the site under existing conditions and assess the flood risks to the existing and proposed hospital. The assessment of the flood risks considered the feasibility of evacuation of the hospital during the onset of major flooding of the Darling and/or Murray Rivers.

A separate and detailed Flood Emergency Response Plan (FERP) was prepared in November 2022 (*draft*) to provide a detailed set of protocols for the hospital to follow during a flood emergency, including flood awareness and preparedness of staff. This included a detailed analysis of flood evacuation routes and warning times, and evacuation triggers.

As part of the Review of Environmental Factors (REF) process Advisian has been engaged by Health Infrastructure to prepare the following Flood Impact and Risk Assessment (FIRA) as supporting documentation. The FIRA is to compile all relevant flood and response management information from the prior preliminary flood assessment and FERP.

FIGURE 1

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LOCATION OF THE EXISTING WENTWORTH HOSPITAL SITE

2 Assessment of Existing Flood Characteristics

The Wentworth Hospital Redevelopment is to be located at the site of the existing Wentworth Hospital at 24 Hospital Road, Wentworth (*refer* **Figure 1**). Development plans indicate that the new hospital will be constructed within the boundaries of the existing Hospital Levee and to the south-west of the existing building.

Records from historic floods indicate that the Hospital Levee can provide protection to the site during major flooding of the Murray and Darling Rivers. During the 1956 and 1974 floods the Hospital Levee was not breached with peak flood levels reaching 0.5 and 1.3 metres below the typical levee crest elevation, respectively.

Without the hospital levee the site would be at risk of inundation during flood events as frequent as the 5% Annual Exceedance Probability (AEP) flood. Accordingly, the viability of the site for use as a hospital precinct is heavily reliant on maintaining the levee.

The following sections provide an overview of the predicted flood characteristics at the hospital site and surrounds for existing conditions. The results are based on modelling completed for 'the '*Wentworth Flood Study*' (Rev D) dated July 2021.

2.1 Background

2.1.1 History of Flooding

The Murray River in the vicinity of Wentworth has a long history of flooding. The most notable floods recorded since European settlement along this section of the Murray River include the 1870, 1917, 1931, 1956, 1974 and 1975 floods. The 1956 flood is considered to be approximately equivalent to the design 1% AEP flood.

In response to the 1870 flood, levee banks were constructed during the 1880's around the township of Wentworth and around Wentworth Hospital. The 1956 flood showed many sections of these levees to be inadequate, requiring them to be repaired, rebuilt and raised.

A photo of the 1956 flood taken from above the Darling River and facing towards the Murray River confluence is shown in **Plate 1**. The Wentworth Hospital can be seen in the foreground protected by the levee system. Hospital Road, the Silver City Highway and the bridge crossing to the Wentworth Town centre all appear to be accessible at the time. A second photo of the 1956 flood looking north-west towards the Wentworth Hospital and Wentworth Town is shown as **Plate 2**. It is not clear at what stage of the event both photos were taken.

Maintenance of the levees was undertaken in 1975 to ensure the levee crests were above the peak level of the 1956 flood. Topographic surveys undertaken in June 2022 by Walpole Surveying indicate that the Hospital Levee currently has minimum crest elevations of 35.6 mAHD. In comparison, the official recorded peak flood level for the 1956 flood is 34.85 mAHD. Hence, the existing hospital levee has a crest elevation that is at least 0.75 metres above the peak level of the 1956 flood.

Peak flood levels at the Wentworth Hospital for the 1870, 1956 and 1974 floods are listed below:

- 1870 Historic Flood – 35.15 mAHD (estimated based on recorded levels at Lock 10)
- 1956 Historic Flood – 34.85 mAHD (recorded)
- 1974 Historic Flood – 34.06 mAHD (recorded)

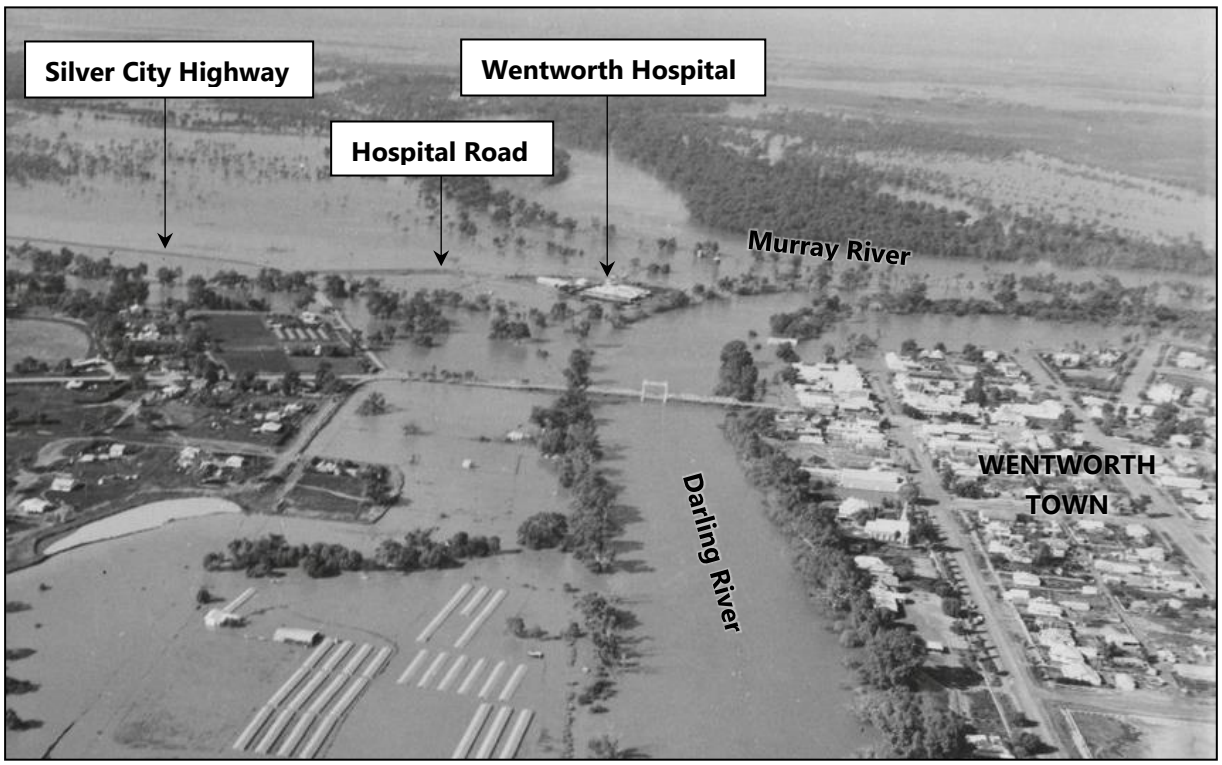


Plate 1 **Photo of the 1956 flood taken above the Darling River with the Murray River and the Wentworth Hospital in the foreground** (*Aerial Photographs taken by Frank Zaetta*)

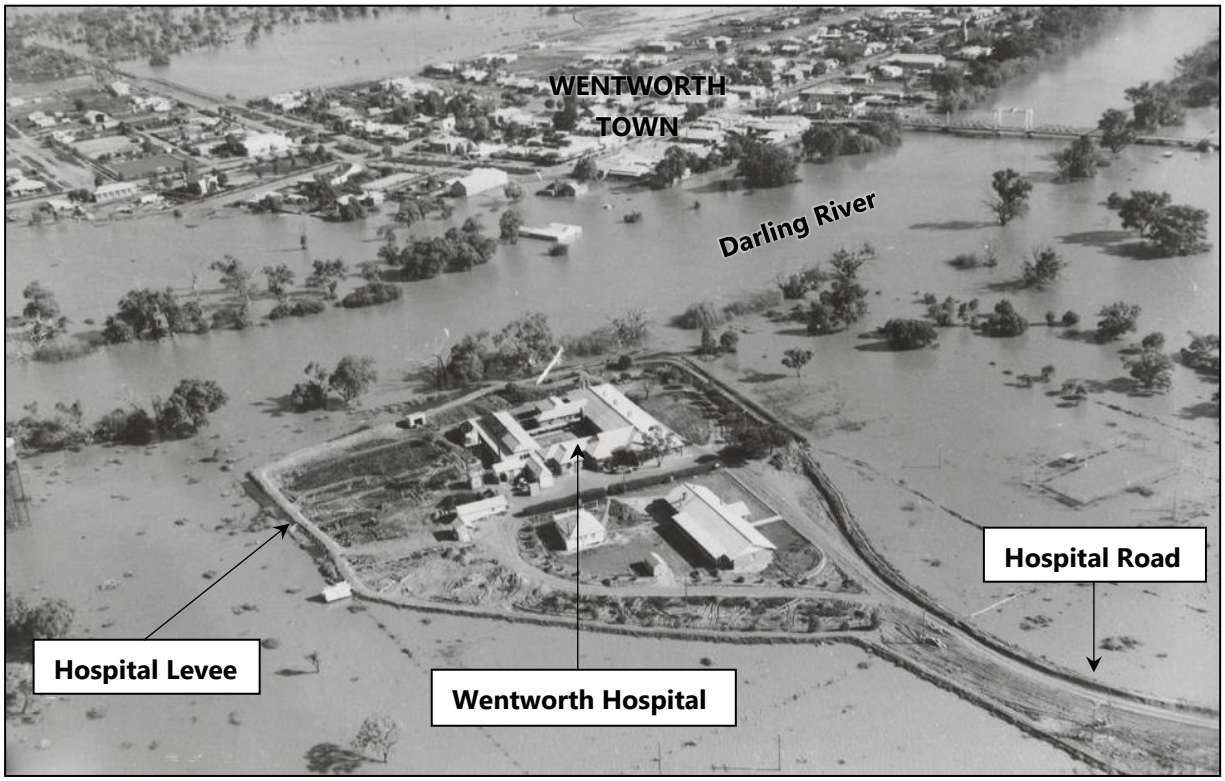


Plate 2 **Photo of the 1956 flood taken looking north-west towards the Wentworth Hospital and Wentworth Town** (*Aerial Photographs taken by Frank Zaetta*)

2.1.2 Wentworth Flood Study

The '*Wentworth Flood Study*' was commissioned by Wentworth Shire Council as part of the process involved in updating the Wentworth Floodplain Management Plan. The project was awarded to Patterson Britton & Partners which has since been purchased by Advisian (Worley Group).

A two-dimensional hydrodynamic model was developed as part of the flood study. The model covers the Murray River floodplain from Gol Gol to downstream of the Darling River Anabranch and the Darling River floodplain from north of Pomona to the confluence with the Murray River. The hydrodynamic model was developed using the RMA-2 software. RMA-2 is a fully two-dimensional finite element model developed by Resource Management Associates of the USA and Professor Ian King of the University of California, Davis.

Further details of the RMA-2 model including its extent, input data and model schematisation is available in the '*Wentworth Flood Study*' (*Rev D – Final Draft, 2021*).

The two-dimensional model that was developed as part of the Wentworth Flood Study has been used to simulate the 1956 and 1974 historical floods and the 10%, 5% and 1% AEP events, as well as the and 1 in 200 AEP event. Peak flow magnitudes for the design events along the Murray and Darling Rivers were derived from flood frequency analysis (FFA) prepared as part of the flood study.

A hypothetical 'extreme flood' was also assessed. It is based on the adoption of inflows that are three (3) times those determined by flood frequency analysis for the 1% AEP flood. Based on extrapolation of the FFA curves prepared as part of the flood study, the adopted 'extreme' event is estimated to have an AEP exceeding 1 in 10,000 along the Murray River and between 1 in 2,000 and 5,000 along the Darling.

The adopted extreme event is considered to be a reasonable estimate of a Probable Maximum Flood (PMF) which is typically considered to have an AEP in the order of 1 in 10,000 for very large catchments exceeding 100,000 km^2 (*refer Section 3.4.2 of Book 8, ARR19*). Although the estimated AEP along the Darling River is lower, the resulting flow does fall within the 90% confidence intervals for a 1 in 10,000 AEP event for the adopted FFA curve.

The flood study includes figures for the study area which show the variation in peak flood level, depth and flow velocity along the Darling and Murray Rivers and across their adjoining floodplains. It also includes flood hazard and hydraulic category mapping.

2.2 Description of the Site and Levee

The Wentworth Hospital Redevelopment is to be located inside the existing Hospital Levee and to the south-west of the existing building.. As shown in **Plate 3**, there is approximately 1 hectare of land within the area protected by the levee that is outside of the existing footprint of the main hospital building and all ancillary facilities, including student and staff accommodation.

The site survey (*refer* **Appendix A**) determined the following Finished Floor Levels (FFLs) for the various buildings on site:

- Main Hospital Building – Between 34.59 and 35.18 mAHD
- Student Accommodation Building – 34.65 mAHD
- Staff Accommodation 'Metal Sheet Building' – 35.44 mAHD
- Other buildings – Typically between 34.5 and 35.0 mAHD (*refer* **Appendix A**)

Plate 3 Aerial Photo of the Wentworth Hospital site dated July 2022 (*Source: NearMap*)

The topography across the site has been determined from surveyed spot elevations which have been used to develop the thematic map of elevation shown in **Figure 2**. The survey indicates that topographic elevations across the site generally vary between 34.0 and 35.0 mAHD. These elevations are 1 to 2 metres below the crest elevations of the Hospital Levee which typically range between 35.6 and 35.8 mAHD (*refer* **Figure 2**). A maximum crest elevation along the levee of 35.85 mAHD was surveyed near the north-western corner of the levee.

Crest elevations along Hospital Road and the Hospital Levee are shown as a longitudinal profile on **Figure 3**. The profile indicates that there is a low-point along the levee system at the Hospital Road entrance to the site. Hospital Road has a crest elevation of 35.3 mAHD at the entrance compared to levee heights of around 35.7 mAHD either side of the road (*refer* **Plate 4**).

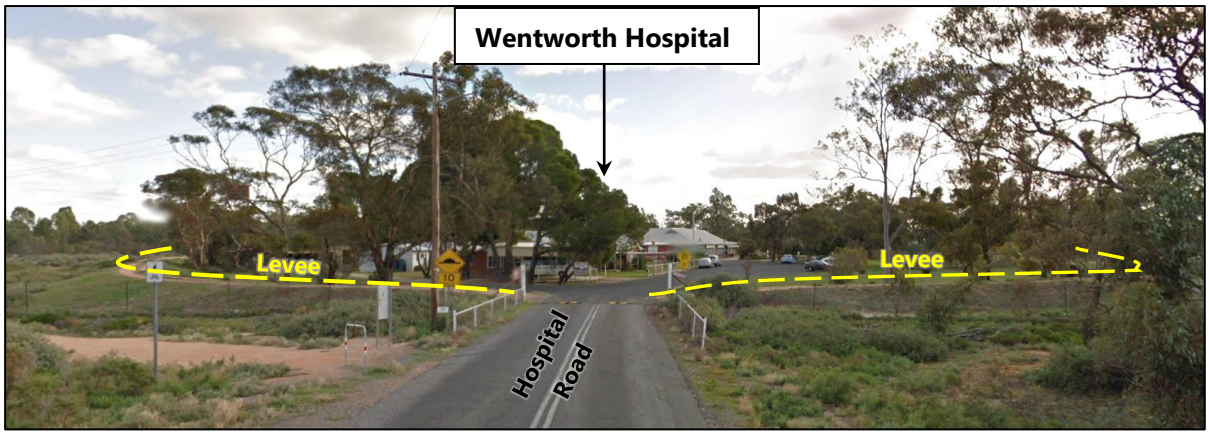
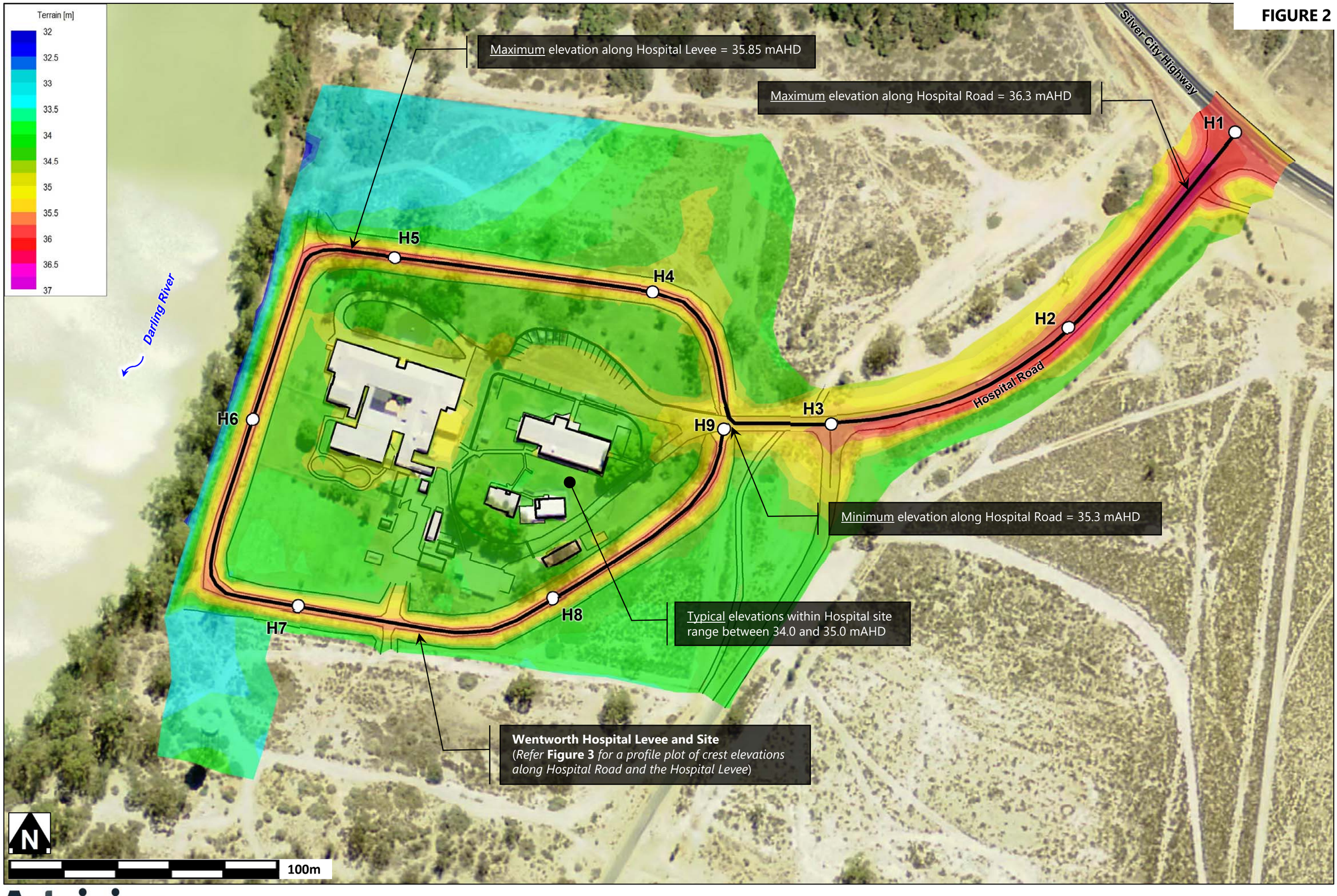


Plate 4 Google Street View image showing the gap in the Hospital Levee at the Hospital Road entrance (*Source: Google Maps*)

FIGURE 2



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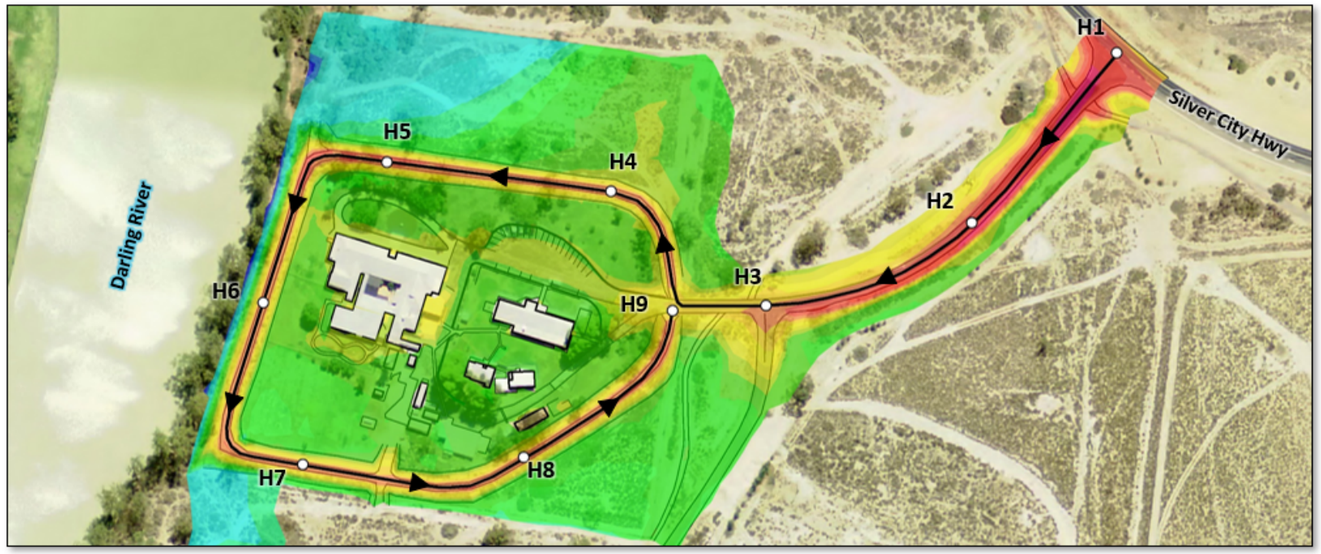
EXISTING TOPOGRAPHY ACROSS THE EXISTING HOSPITAL SITE BASED ON SITE SURVEY

FIGURE 3



LEGEND

- Topography along the Hospital Road and Levee
- Predicted 5% AEP Flood Levels
- Predicted 1% AEP Flood Levels
- Predicted 1 in 200 AEP Flood Levels
- Predicted Extreme Flood Levels
- Predicted Historic 1956 Flood Levels
- Predicted Historic 1974 Flood Levels

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EXISTING TOPOGRAPHY AND PREDICTED FLOOD SURFACE PROFILES ALONG THE HOSPITAL ROAD AND LEVEE

2.3 Predicted Flood Behaviour

Predicted flood behaviour for the 5%, 1% and 1 in 200 AEP events, and the adopted 'extreme' flood, are discussed in the following sections. The results have been extracted from modelling that was completed as part of the '*Wentworth Flood Study*' (*Rev D – Final Draft, July 2021*).

2.3.1 Flood Extents and Levels

Peak flood extents and flood levels are shown in **Figures 4** to **7** for the 5%, 1% and 1 in 200 AEP events and the adopted 'extreme' flood, respectively.

The mapping indicates that the hospital site would not be inundated during flooding up to and including the 1 in 200 AEP event (*refer* **Figure 6**). During the 'extreme' event, the site would be completely inundated, including the entire length of the Hospital Levee and Hospital Road (*refer* **Figure 7**).

The Wentworth town centre is first predicted to be inundated between a 1% and 1 in 200 AEP event (*refer* **Figures 5** *and* **6**). The Wentworth East levee is not predicted to be overtopped during floods up to and including the 1 in 200 AEP event.

Peak flood levels in the vicinity of the hospital site and along the Hospital Levee are predicted to be:

- Between 34.06 and 34.12 mAHD at the peak of a 5% AEP event (*refer* **Figure 4**).
- Between 34.82 and 34.86 mAHD at the peak of a 1% AEP event (*refer* **Figure 5**).
- Between 35.08 and 35.13 mAHD at the peak of a 1 in 200 AEP event (*refer* **Figure 6**).
- Between 35.91 and 35.95 mAHD at the peak of the 'extreme' event (*refer* **Figure 7**).

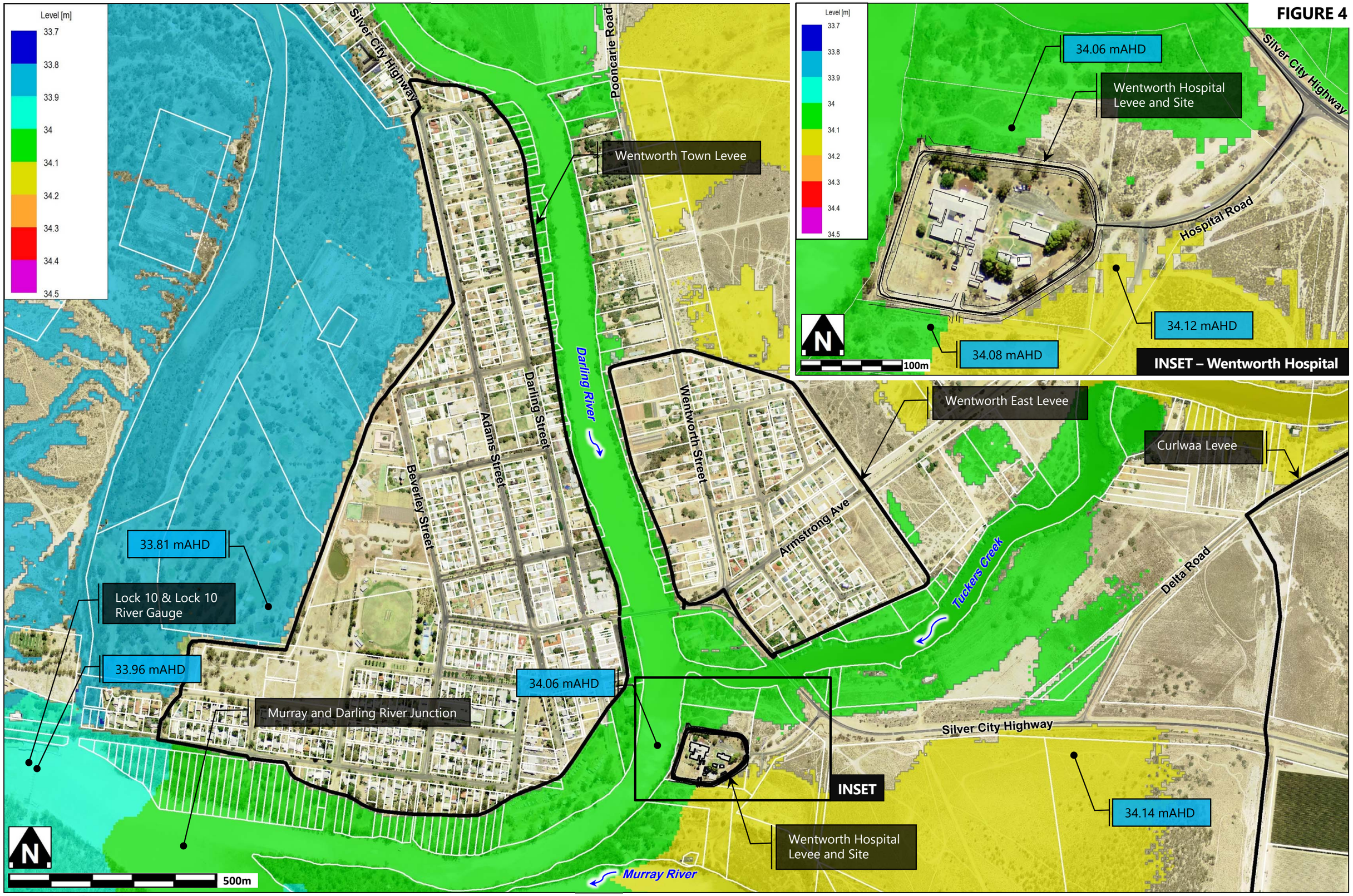
The predicted flood levels are superimposed on the longitudinal profile shown as **Figure 3** for Hospital Road and the Hospital Levee.

2.3.2 Flood Depths and Flow Velocities

Mapping of predicted peak flood depths and flow velocity vectors is provided in **Figures 8** to **11** for the 5%, 1% and 1 in 200 AEP events, and the adopted 'extreme' flood, respectively. The velocity vectors show the direction of flow at the peak of the flood and indicate the magnitude of the flow velocity based on the length of the vector with reference to the legend at the bottom-left hand corner of each figure.

The mapping indicates that flow velocities would be low around much of the site with magnitudes ranging between 0.1 and 0.4 m/s for floods up to and including the 1 in 200 AEP event. Flow velocities are highest along the western site boundary due to its position along the eastern bank of the Darling River. Flow velocities along the Darling River immediately west of the site are predicted to range between 0.5 and 0.7 m/s for floods up to and including the 1 in 200 AEP event (*refer* **Figures 8** *to* **10**).

FIGURE 4



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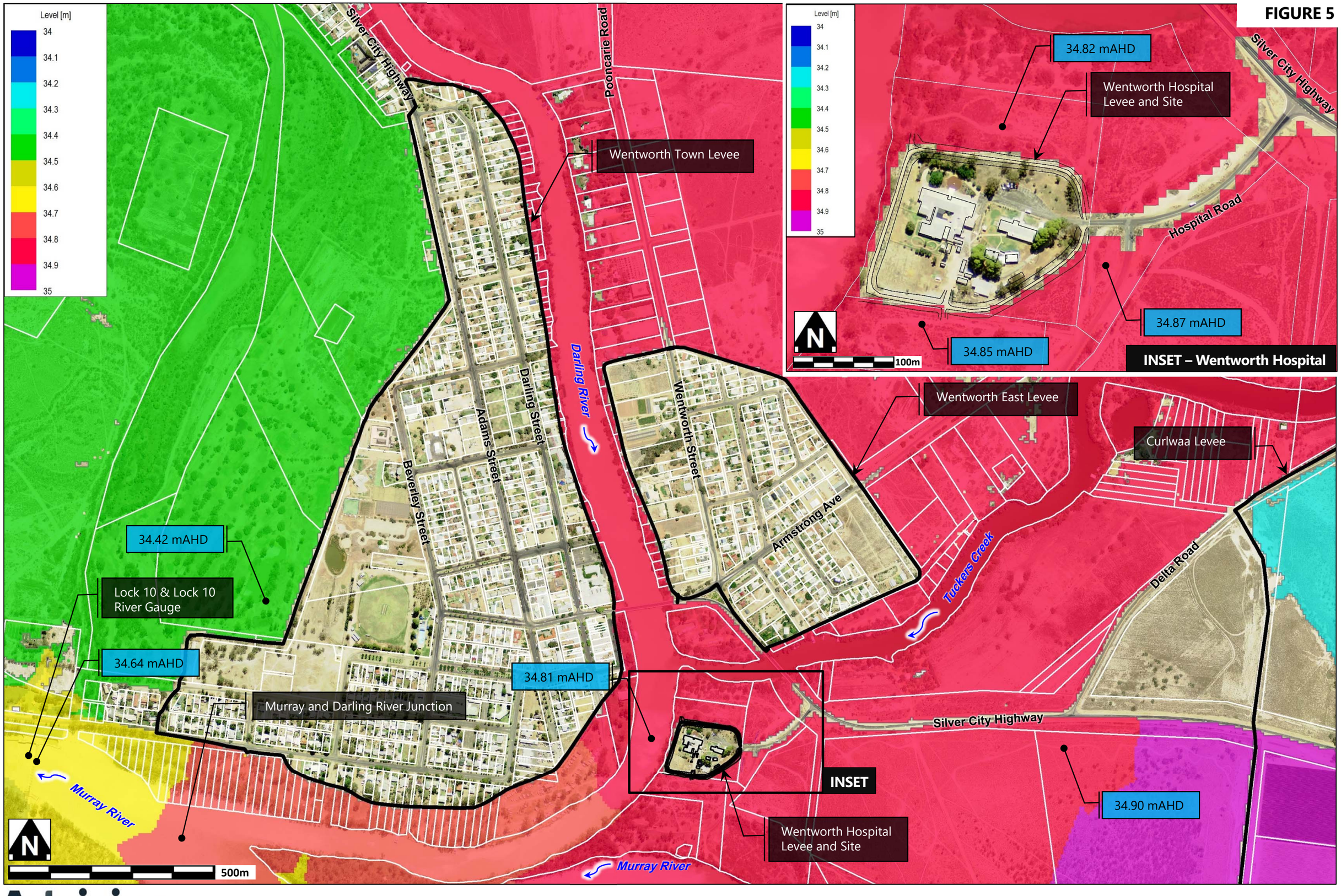
PREDICTED FLOOD LEVELS AT THE PEAK OF A 5% AEP FLOOD ALONG THE MURRAY AND DARLING RIVERS

FIGURE 5



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PREDICTED FLOOD LEVELS AT THE PEAK OF A 1% AEP FLOOD ALONG THE MURRAY AND DARLING RIVERS

FIGURE 6

Level [m]
34.5
34.6
34.7
34.8
34.9
35
35.1
35.2
35.3
35.4
35.5
35.6

Silver City Highway
Pooncarie Road
Wentworth Town Levee
Darling River
Adams Street
Darling Street
Beverley Street
Wentworth Street
Armstrong Ave
Wentworth East Levee
Curlwaa Levee
Tuckers Creek
Delta Road
Silver City Highway
34.60 mAHD
Lock 10 & Lock 10 River Gauge
34.85 mAHD
Murray and Darling River Junction
35.06 mAHD
35.17 mAHD
INSET
Wentworth Hospital Levee and Site
Murray River
Murray River
N
500m

Level [m]
34.5
34.6
34.7
34.8
34.9
35
35.1
35.2
35.3
35.4
35.5
35.6

35.08 mAHD
Wentworth Hospital Levee and Site
Silver City Highway
Hospital Road
35.13 mAHD
35.09 mAHD
N
100m
INSET – Wentworth Hospital

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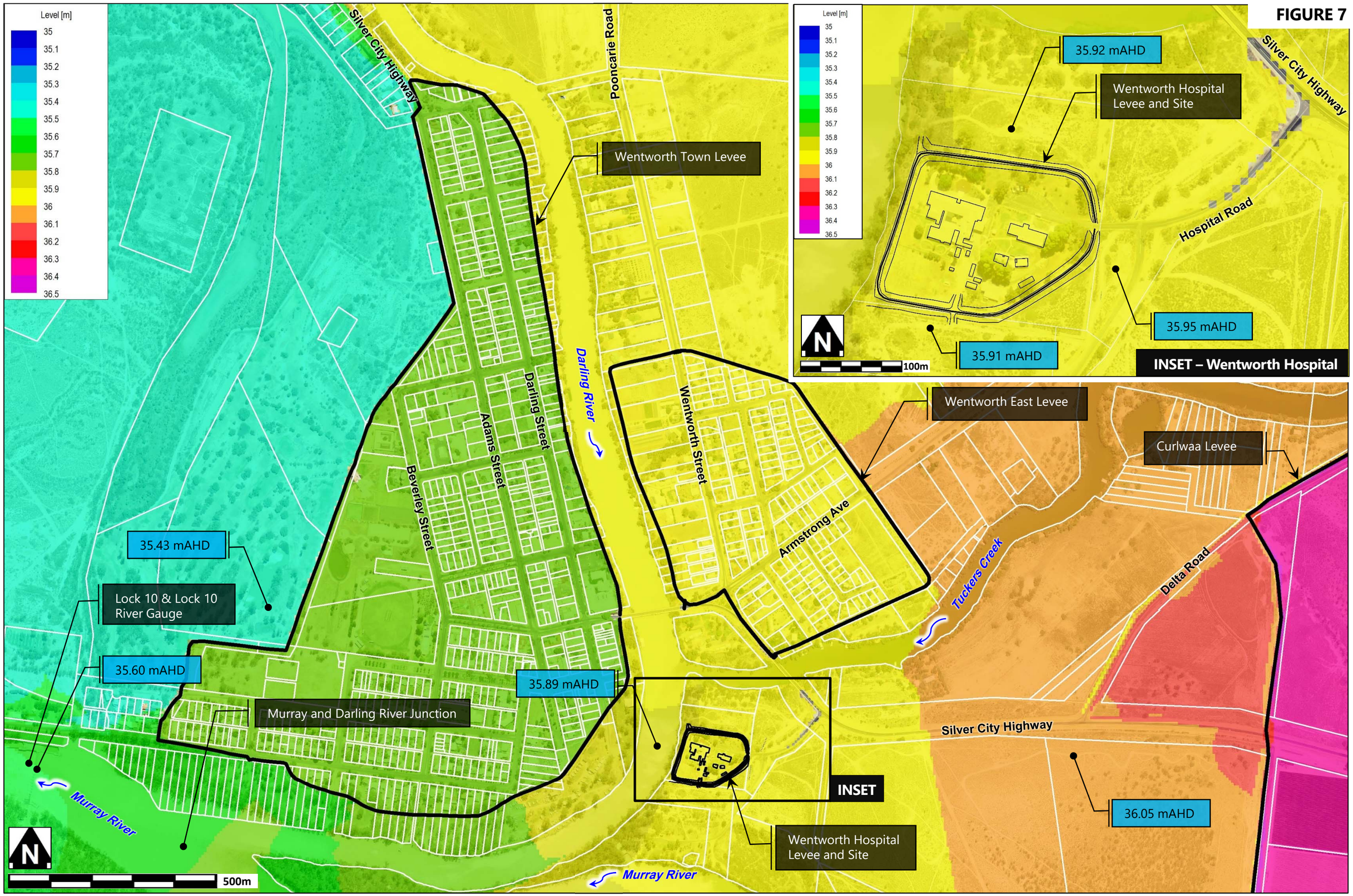
PREDICTED FLOOD LEVELS AT THE PEAK OF A 1 IN 200 AEP FLOOD ALONG THE MURRAY AND DARLING RIVERS

FIGURE 7



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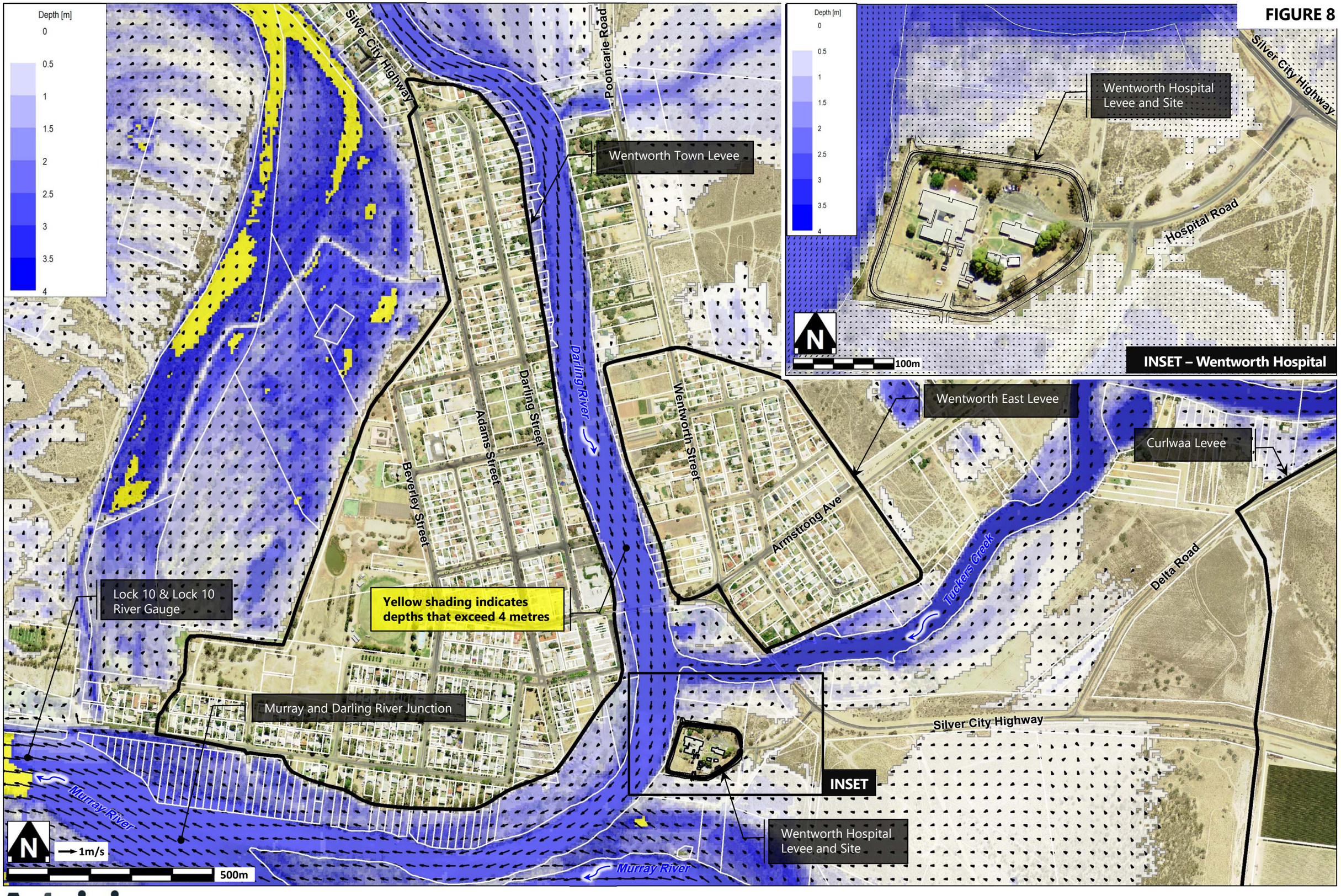
PREDICTED FLOOD LEVELS AT THE PEAK OF THE PROBABLE MAXIMUM FLOOD ALONG THE MURRAY AND DARLING RIVERS

FIGURE 8



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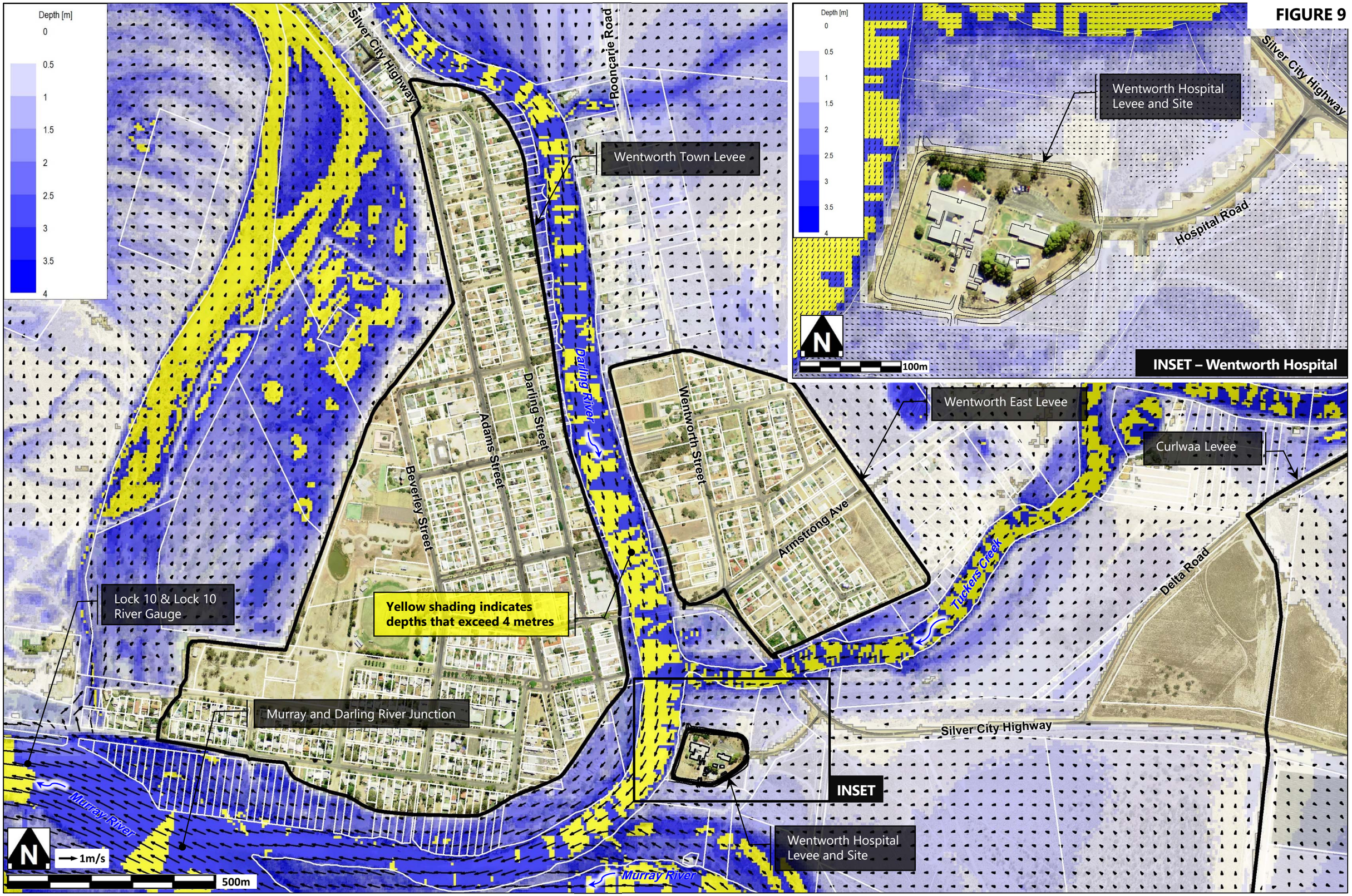
PREDICTED DEPTHS AND FLOW VELOCITIES AT THE PEAK OF A 5% AEP EVENT ALONG THE MURRAY AND DARLING RIVERS

FIGURE 9



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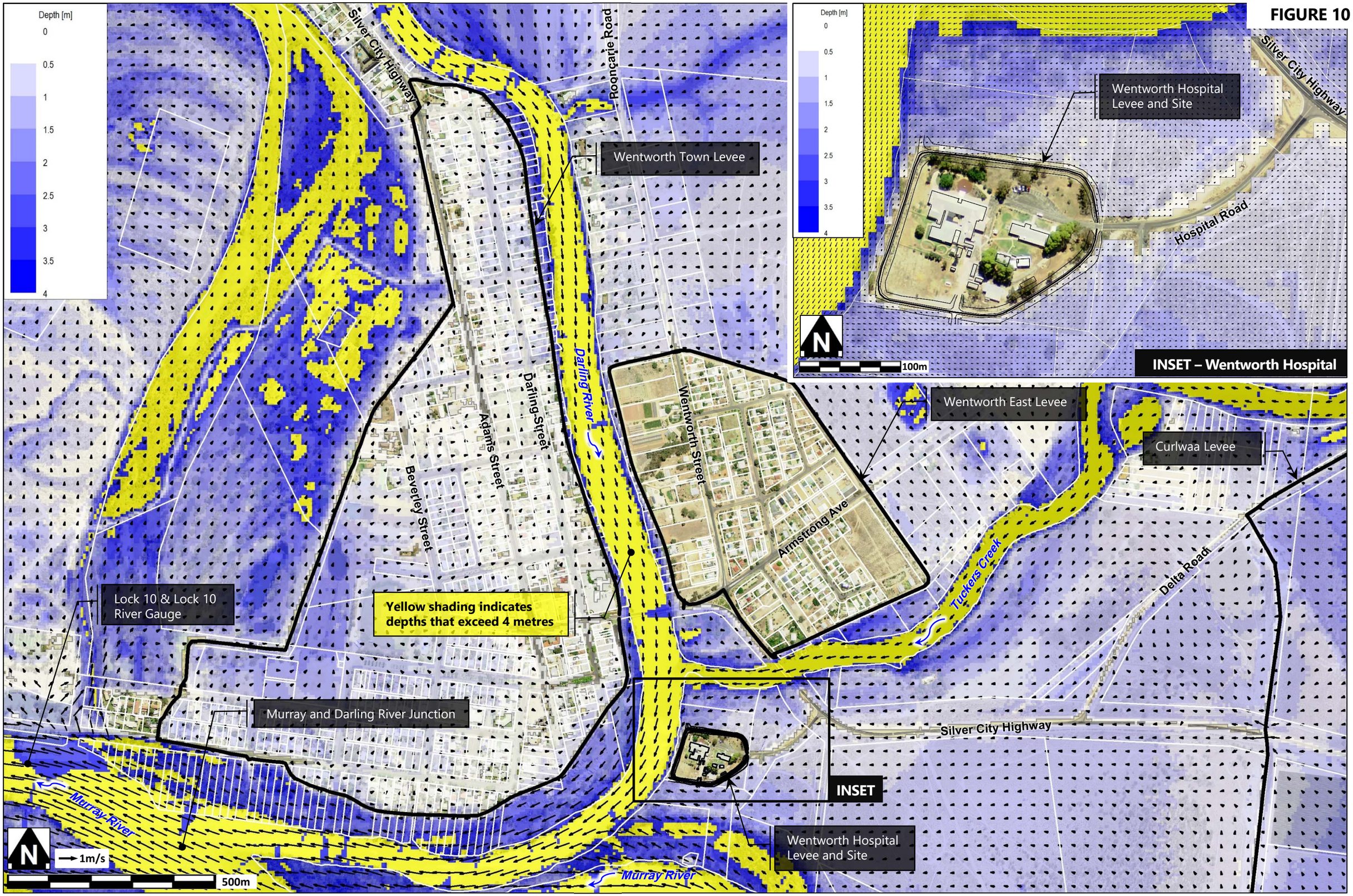
PREDICTED DEPTHS AND FLOW VELOCITIES AT THE PEAK OF A 1% AEP EVENT ALONG THE MURRAY AND DARLING RIVERS

FIGURE 10



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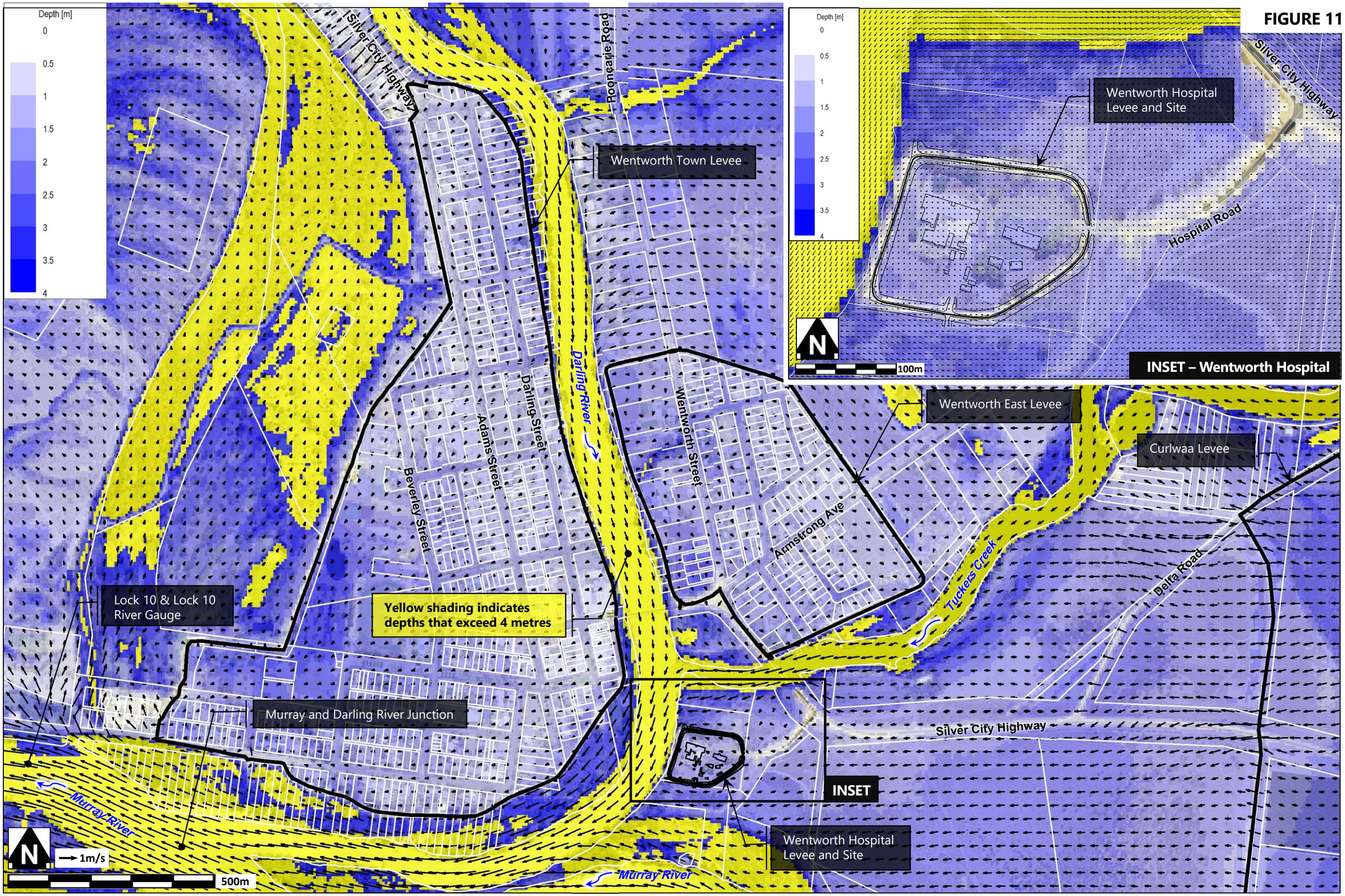
PREDICTED DEPTHS AND FLOW VELOCITIES AT THE PEAK OF A 1 IN 200 AEP EVENT ALONG THE MURRAY AND DARLING RIVERS

FIGURE 11



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PREDICTED DEPTHS AND FLOW VELOCITIES AT THE PEAK OF THE PROBABLE MAXIMUM FLOOD ALONG THE MURRAY AND DARLING RIVERS

2.3.3 Flood Hazard

The flood hazard describes the potential impact that flooding would have on development and people in a particular area and reflects the risks to which people in that area could be exposed. The hazard category relevant to a particular location within the floodplain is determined based on the predicted magnitude of flood depths and flow velocities and a combination of both, referred to as the velocity-depth product.

A description of the hydraulic criteria for each hazard classification according to *Australian Rainfall & Runoff 2019* is provided in **Plate 5**.

Mapping of the flood hazard in the vicinity of Wentworth and the Wentworth Hospital is presented in **Figure 12** for the 1% AEP flood. The mapping shows that hazards are predicted to range between H3 to H4 around the perimeter of the Hospital Levee.

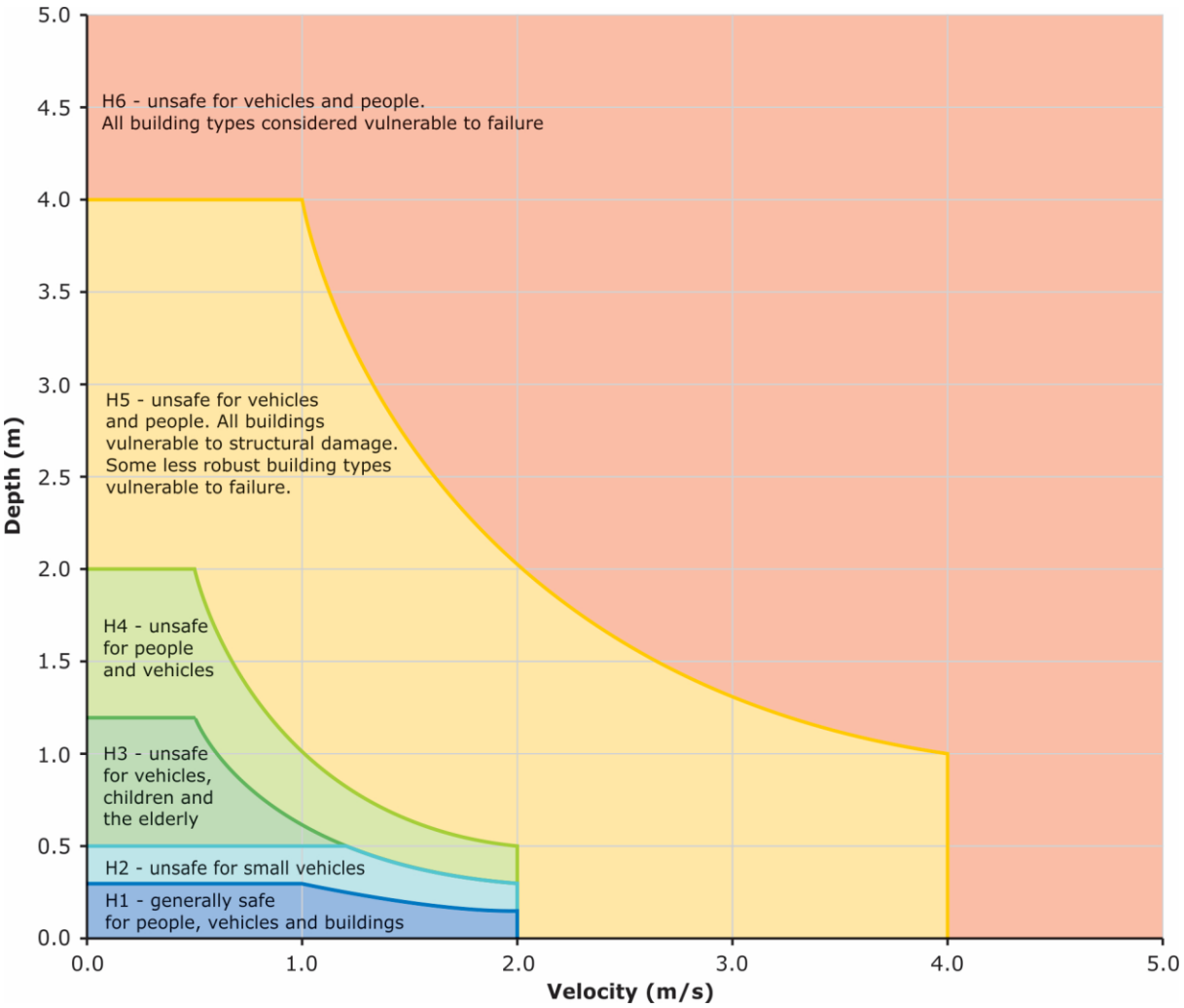

Plate 5 Flood Hazard Classification according to Australian Rainfall & Runoff 2019

FIGURE 12

Hazard
H1
H2
H3
H4
H5
H6

Silver City Highway
Pooncarie Road
Wentworth Town Levee
Darling River
Adams Street
Darling Street
Beverley Street
Wentworth Street
Armstrong Ave
Wentworth East Levee
Curlwaa Levee
Tuckers Creek
Delta Road
Silver City Highway
Lock 10 & Lock 10 River Gauge
Murray and Darling River Junction
Murray River
Murray River
INSET
Wentworth Hospital Levee and Site
N
1m/s
500m

Hazard
H1
H2
H3
H4
H5
H6

Wentworth Hospital Levee and Site
Silver City Highway
Hospital Road
N
100m
INSET – Wentworth Hospital

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FLOOD HAZARD MAPPING FOR THE 1% AEP EVENT

2.3.4 Hydraulic Categories / Flood Function

The hydraulic category for a site identifies the potential for development to impact on existing flood behaviour. The NSW Government's '*Floodplain Development Manual*' (*2005*) divides flood prone land into three hydraulic categories; namely Floodway, Flood Storage and Flood Fringe.

The '*Wentworth Flood Study*' (*Rev D – Final Draft, July 2021*) includes an assessment of hydraulic categories based on application of the methodology developed by Thomas & Golaszewski (*2012*). This methodology incorporates an iterative approach that considers a range of flood parameters including flood depth, velocity and velocity-depth product, as well as consideration of flow distribution and floodplain geomorphology to define the floodway extent. The approach suggests that the floodway can generally be defined as the extent of floodplain required to convey 80% of the total flood flow.

Although the 1% AEP event is typically adopted for this assessment, larger events such as the 1 in 200 AEP were also considered to identify flow breakouts that are critical to maintaining flow conveyance.

Hydraulic category mapping for Wentworth and the Wentworth Hospital have been extracted from mapping prepared for the *Wentworth Flood Study* (*Rev D, 2021*) and is reproduced as **Figure 13**. The mapping shows that the floodplain surrounding the Wentworth Hospital is primarily categorised as flood storage. The Darling River channel and parts of Tuckers Creek are categorised as floodway.

FIGURE 13

LEGEND:

- Flood Fringe
- Flood Storage
- Floodway

Wentworth Town Levee

Wentworth Hospital Levee and Site

Wentworth East Levee

Curlwaa Levee

Lock 10 & Lock 10 River Gauge

Murray and Darling River Junction

INSET

INSET – Wentworth Hospital

Wentworth Hospital Levee and Site

Silver City Highway

Pooncarie Road

Darling River

Adams Street

Darling Street

Beverley Street

Wentworth Street

Armstrong Ave

Hospital Road

Tuckers Creek

Delta Road

Murray River

N

1m/s

500m

100m

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HYDRAULIC CATEGORY MAPPING FOR THE 1% AEP EVENT

3 Impact of the Development on Local Flood Behaviour

3.1 Description of the Proposed Hospital Redevelopment

3.1.1 Proposed Health Services

The new Wentworth Health Service Redevelopment will include a total of 20 inpatient beds (including one HiTH or virtual bed) with five acute, six sub-acute and eight beds under the Transitional Aged Care Program (TACP). Sub-acute inpatient beds will be utilised to rehabilitate or recondition patients either as a step-down from acute care, direct admission from the Urgent Care Centre (UCC) or transfer from external facilities. The TACP optimises the functioning and independence of older adults following a hospital stay to allow a return to their homes. One telehealth (HiTH) or virtual bed will facilitate consultations from external tertiary facilities to the hospital as well as from the hospital to patients at home.

The new UCC incorporates a triage and two treatment bays including a procedure room. The Community Health/Ambulatory Care area includes GP Services and will have three consult rooms, one universal consult room, and one interview room.

The existing hospital was historically a 20-bed inpatient health service, although 15 beds are currently operational. Accordingly, the number of inpatients will not increase significantly for the new facility.

There are two existing two-person staff and student accommodation buildings in good condition on the existing hospital site. They are proposed to be retained. In addition, there will be three additional accessible two-person accommodation to be planned under the scope of this project.

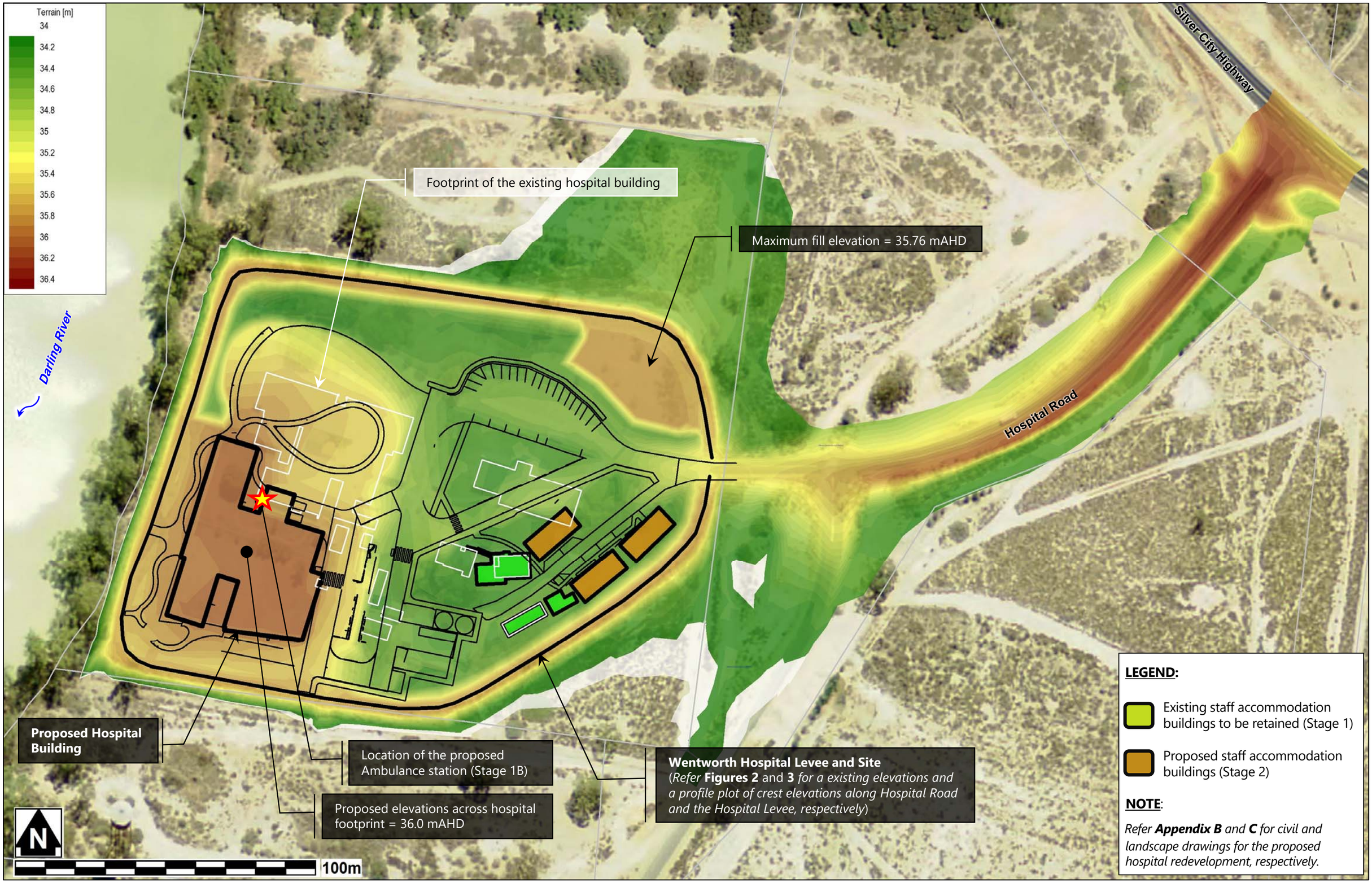
3.1.2 Proposed Development

The proposed layout for the Wentworth Health Service Redevelopment is shown in **Figure 14**. The layout is based on information extracted from Civil and Landscaping drawings prepared by Taylor Thomson Whitting (TTW) and NBRS and Partners Pty Ltd, respectively. The civil and landscaping drawings are included as **Appendix B** and **Appendix C**, respectively.

The new Wentworth Hospital building is to be located within the confines of the existing Hospital Levee and to the southwest of the existing hospital (*refer* **Figure 14**). As shown in **Figure 14**, there is minor overlap between the existing and proposed building footprints that is limited to the northern-most parts of the proposed building. The ambulance bays that are proposed at this location are to be constructed during Stage 1B of the redevelopment and following demolition of the existing hospital.

As shown in **Figure 14** and **Figure 15**, the development is to require earthworks inside the bounds of the existing Hospital Levee. The earthworks will include construction of a fill pad for the proposed hospital building. The fill pad is proposed to have a crest elevation of 36.0 mAHD, which is up to 2.05 metres above existing surface elevations and 0.05 metres above the predicted extreme flood level for the site.

The hospital building is to be constructed with a slab-on-ground floor with a Finished Floor Level (*FFL*) of 36.0 mAHD for the main building and 35.85 mAHD for the loading and ambulance bays (*refer* **Appendix B**).



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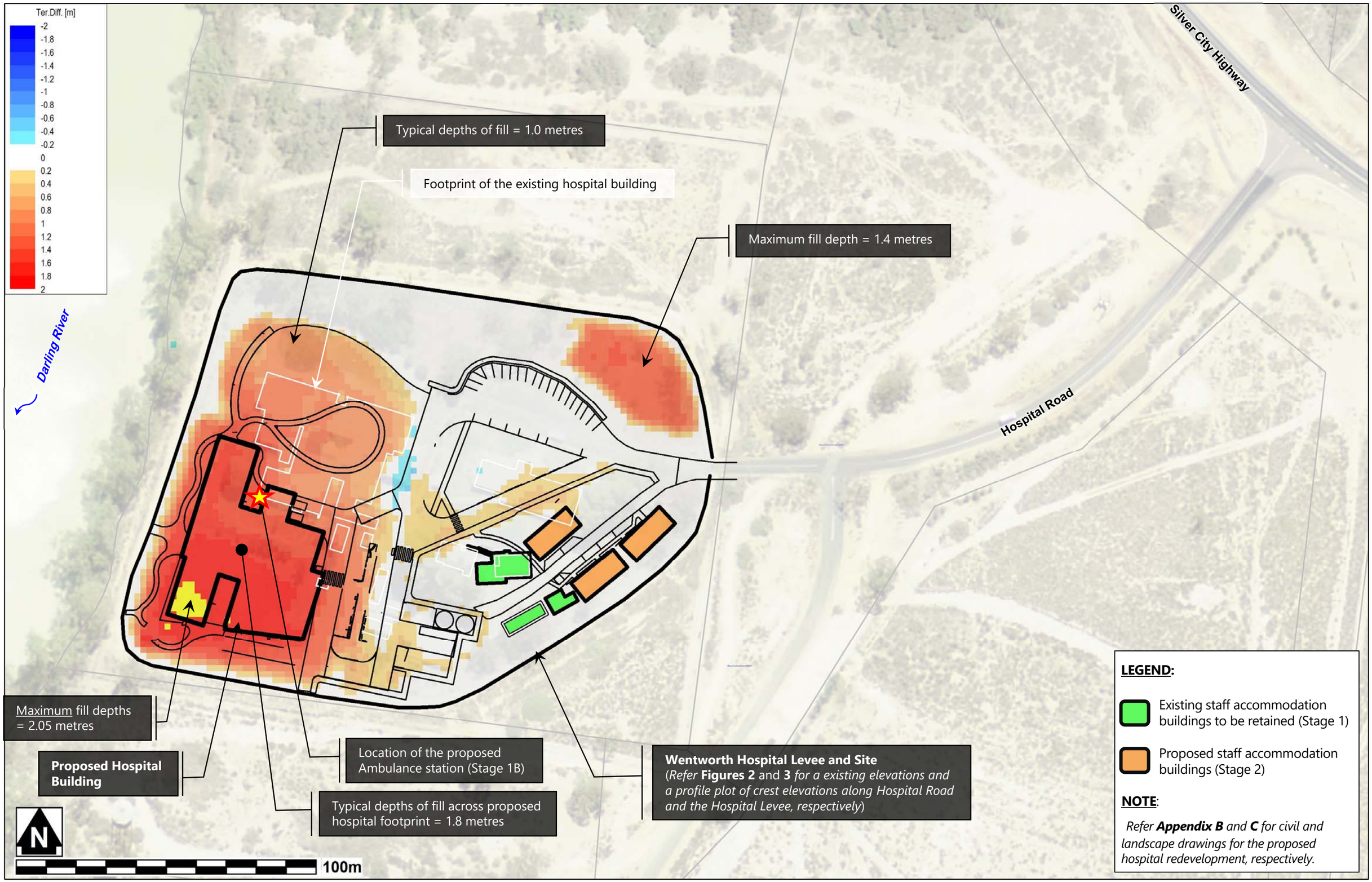
LAYOUT OF THE HOSPITAL REDEVELOPMENT AND PROPOSED SURFACE ELEVATIONS



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LAYOUT OF THE HOSPITAL REDEVELOPMENT AND PROPOSED CUT AND FILL DEPTHS

Two existing buildings used for staff accommodation are to be retained. Two additional staff accommodation buildings are proposed during Stage 2. The locations of these buildings are shown on **Figure 14**.

3.2 Impacts of the Proposed Development on Flooding

As discussed in **Section 2.3**, the Hospital Levee is not predicted to be overtopped during floods up to and including a 1 in 200 AEP event; that is, a flood with an average recurrence frequency of 200 years.

Predicted peak flood levels in the vicinity of the site are shown in **Figures 16**, **17** and **18** for the 5%, 1% and 1 in 200 AEP events, respectively. As shown, the site and the proposed development will not be affected during events up to and including a 1 in 200 AEP flood. Accordingly, the proposed works inside the Hospital Levee will have no impact on flood behaviour during events up to this magnitude.

As discussed in **Section 2.3**, the levee is predicted to be overtopped during the adopted 'extreme' flood event. Under existing conditions this is predicted to result in the complete inundation of the site with flow velocities and flood depths of up to 0.1 m/s and 2.1 metres, respectively (*refer* **Figure 11**).

Flood modelling for post-development conditions has not been completed for the 'extreme' event. The maximum depth of flow over the levee crest in such an event is only 200 mm, which limits the potential for significant flows across the area inside the levee and therefore, any impacts of the proposed filling on existing flood conditions and flow distribution.

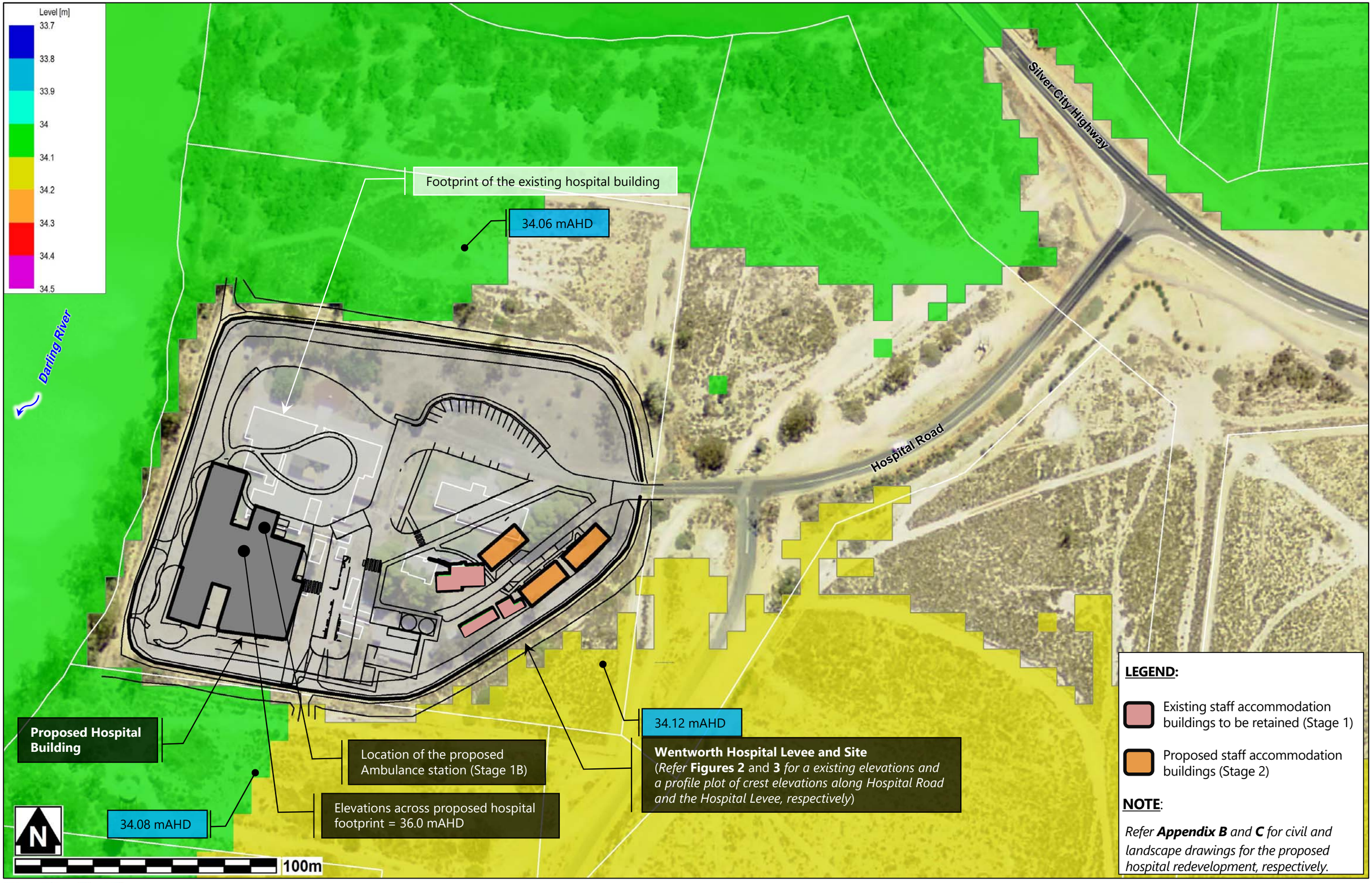
Notwithstanding this, post-development flood mapping has been prepared for the 'extreme' flood by re-mapping the flood surface over a Digital Terrain Model (*DTM*) that includes the earthworks proposed at the site (refer **Figure 19**).

As shown in **Figure 19**, under post-development conditions the entire hospital site is predicted to be inundated with the exception of the hospital building, which will have a Finished Floor Level (*FFL*) of 36.0 mAHD. This FFL will ensure the building is at least 0.05 metres above the predicted 'extreme' flood level. Accordingly, the building will not be at risk of overfloor flooding during Murray and Darling River flood events.

Predicted flood depths and flow velocities during the 'extreme' event are mapped in **Figure 20** for the post-development scenario. The mapping shows that flood depths across the site could reach up to 2.1 metres and flow velocities would be less than 0.1 m/s at all locations.

Any potential impact associated with the reduction in the existing flood storage due to the proposed filling is also considered negligible given the width of the floodplain is about 10 km in the vicinity of Wentworth. The loss in flood storage volume is considered negligible against the significant volume of floodwaters associated with Murray and Darling River floods.

The proposed development will therefore have no impact on peak flood levels or flow velocities for floods up to and including the 1 in 200 AEP event; an event with an average recurrence interval of once every 200 years. The development would have a negligible impact on flood behaviour during the adopted 'extreme' flood event.



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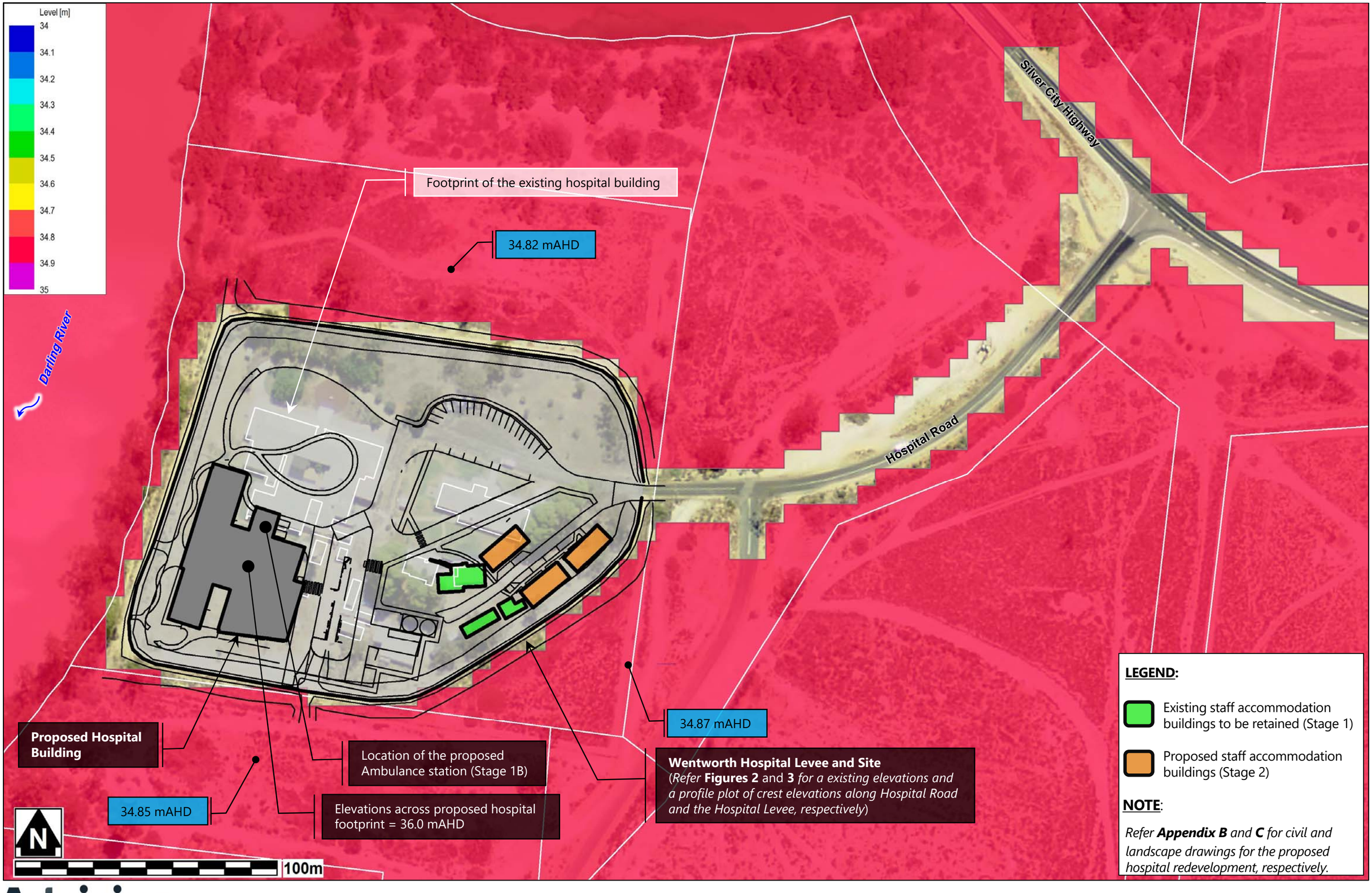
PREDICTED FLOOD LEVELS AND EXTENTS AT THE PEAK OF A 5% AEP FLOOD FOR POST-DEVELOPMENT CONDITIONS



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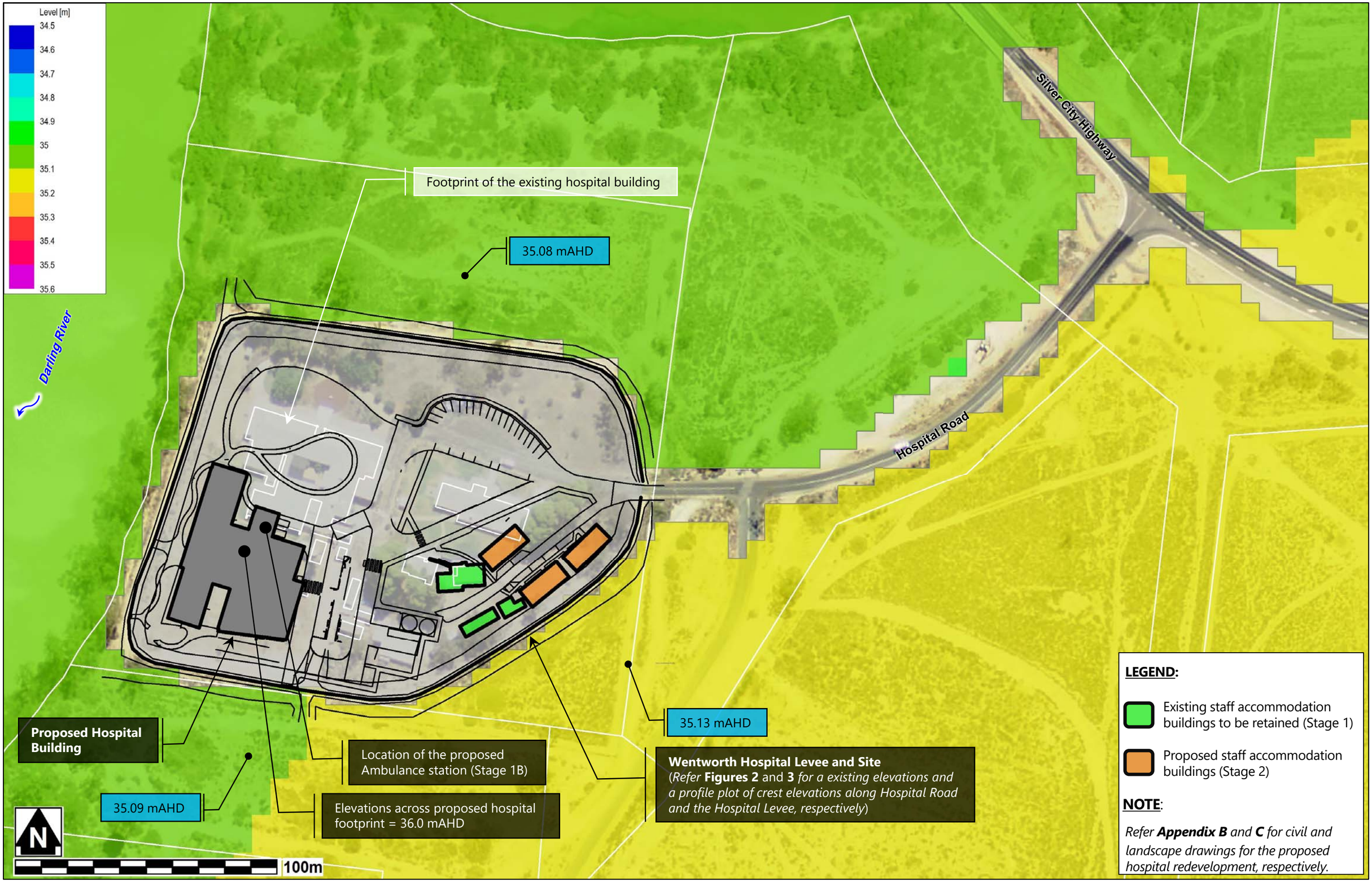
PREDICTED FLOOD LEVELS AND EXTENTS AT THE PEAK OF A 1% AEP FLOOD FOR POST-DEVELOPMENT CONDITIONS



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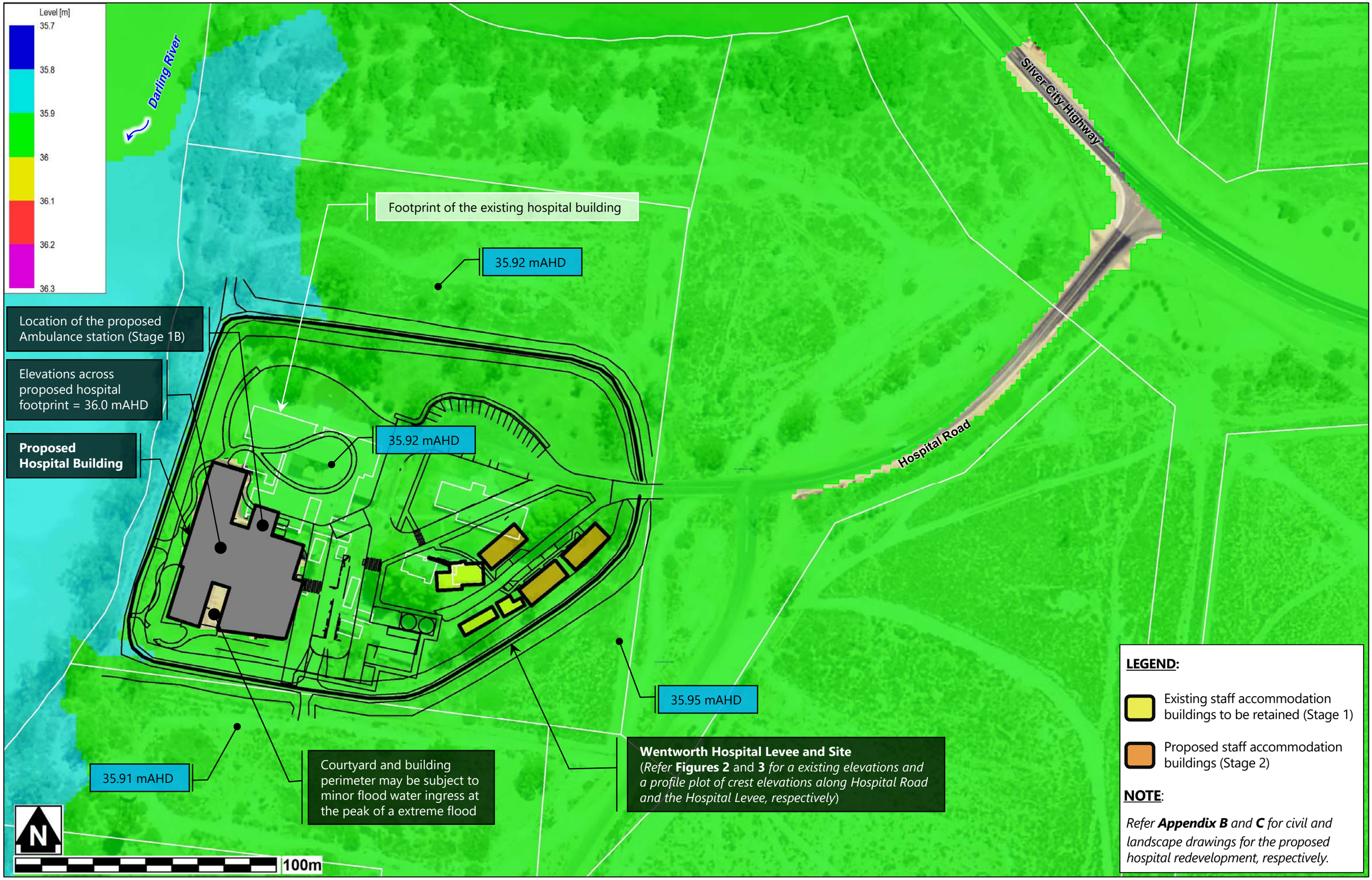
PREDICTED FLOOD LEVELS AND EXTENTS AT THE PEAK OF A 1 IN 200 AEP FLOOD FOR POST-DEVELOPMENT CONDITIONS



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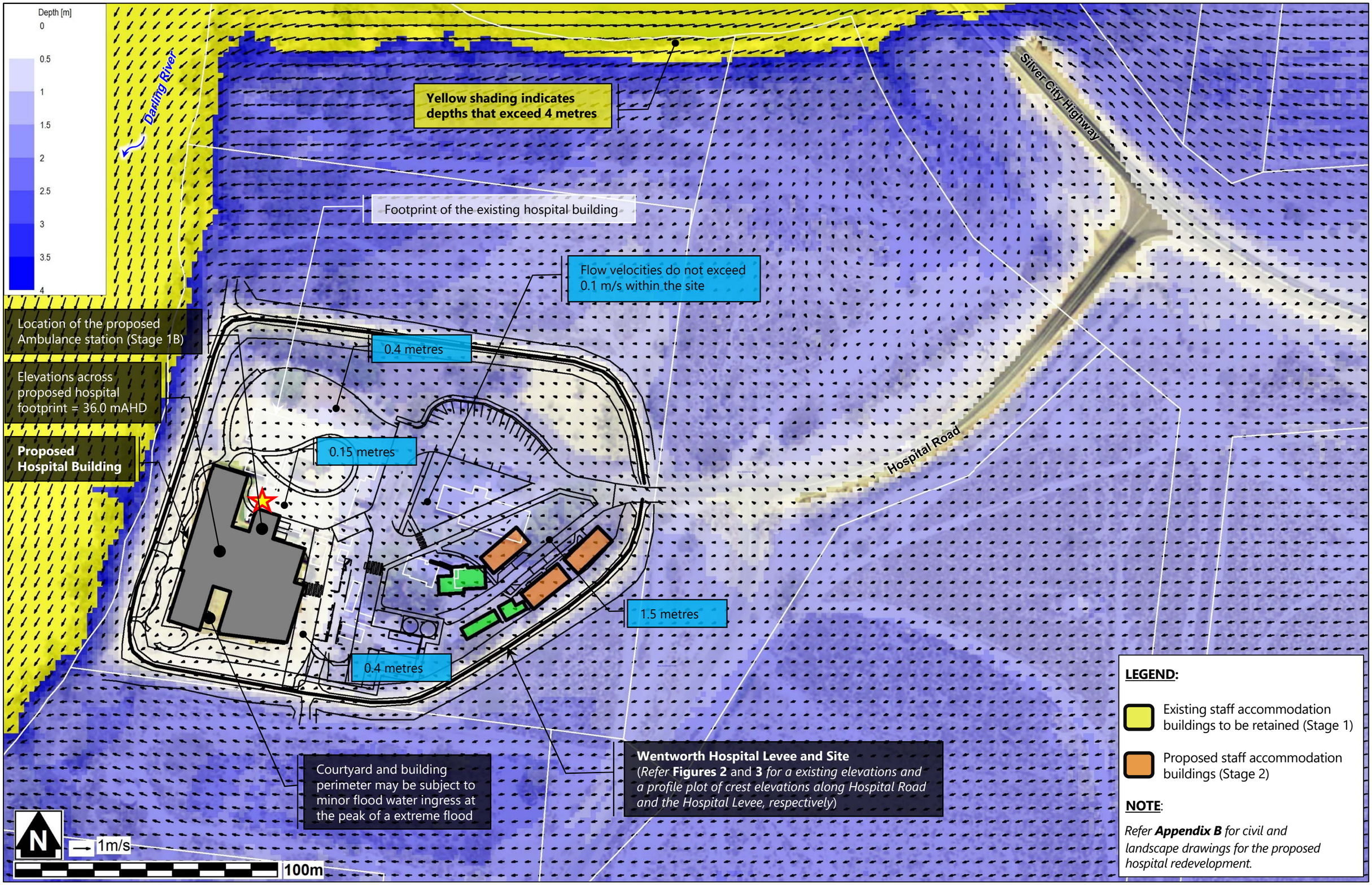
PREDICTED FLOOD LEVELS AND EXTENTS AT THE PEAK OF A EXTREME FLOOD FOR POST-DEVELOPMENT CONDITIONS



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PREDICTED FLOOD DEPTHS AND FLOW VELOCITIES AT THE PEAK OF A EXTREME FLOOD FOR POST-DEVELOPMENT CONDITIONS

4 Flood Risk Assessment

As discussed above, a detailed Flood Emergency Response Plan (FERP) has been prepared for the hospital redevelopment by Advisian in November 2022 (*draft*). Key information and findings from that report are included in the following flood risk assessment.

The assessment considers potential evacuation routes and any constraints, such as low-points in roadways and whether there is adequate warning time available to prepare and safely effect evacuation from the site if required.

4.1 Planning and Guideline Documents

The relevant planning documents that apply to the proposed hospital redevelopment include:

(i) Wentworth Local Environmental Plan 2011 (*refer Section 5.21*)

(ii) Wentworth Shire Development Control Plan 2011 (*refer Chapter 3 Section 4*)

(iii) Wentworth Shire Flood Emergency Sub Plan (*2018*)

(iv) NSW Floodplain Development Manual (*2005*)

(v) State Environmental Planning Policy (*Biodiversity and Conservation*) *2021* (*refer Chapter 5*)

These documents have been considered in preparing the flood risk assessment outlined in the following.

4.2 Potential Flood Risk Issues

The hospital redevelopment is proposed to be sited inside the existing Hospital Levee. As established in **Section 2.3** and shown in **Figure 3**, the existing Hospital Levee is not predicted to be overtopped during floods up to and including a 1 in 200 AEP event. This level of immunity includes the low-point along Hospital Road at the site entrance (*refer* **Plate 4**).

To further mitigate potential flooding impacts and flood risk the new hospital building is to be constructed on a fill mound allowing Finished Floor Levels (FFLs) for the hospital building to be above the peak flood level predicted for the extreme event. As shown in **Figure 14**, this corresponds to a FFL for the hospital building of 36.0 mAHD. This would result in the proposed hospital and its immediate surrounds having minimum floor levels that could be considered as flood free; that is, without risk of being flooded.

The proposed fill mound and minimum floor levels offer a significant benefit compared to the existing hospital. As discussed in **Section 2.2**, the existing hospital has floor levels ranging between 34.59 and 35.18 mAHD, which are below the low-point along the Hospital Levee of 35.3 mAHD. This represents a risk to the exiting hospital buildings, which would be inundated shortly after levee overtopping or failure.

The '*Wentworth Shire Development Control Plan 2011*' (*WSDCP, 2011*) does not outline any minimum floor level requirements specific to critical facilities such as hospitals. '*Section 4 – Flood Affected Land*' of WSDCP 2011 states the following with regarding to minimum floor levels and fill mounds:

(i) Flood Planning Level (FPL) is defined as land at or below a one percent annual exceedance probability food level plus 750 mm (Section 4 of the DCP 2011).

(ii) The top of the mound should be a minimum of 600 mm above the 1% (1% AEP) calculated flood level, so that any structure constructed on the mound is not less than 750mm above a 1% (1% AEP) calculated floor level.

The proposed crest elevation for the fill mound of 36.0 mAHD is over 1 metre above the predicted peak 1% AEP level at the site of 34.87 mAHD (*refer* **Figure 5**). Accordingly, the proposed hospital redevelopment would exceed the criteria for minimum floor levels and minimum fill mound elevations. This is considered appropriate given the hospital is categorised as a critical facility.

Construction of the hospital on a fill mound above the predicted peak extreme flood level mitigates the potential flood damage to the building. Although the new hospital building would not be inundated, evacuation remains a requirement due to the potential for long durations of inundation and isolation that could range between 3 weeks to 3 months. Accordingly, appropriate measures are required to ensure the hospital can be evacuated prior to evacuation routes being inundated.

4.3 Review of Potential Evacuation Routes

As discussed above, the floodplain surrounding Wentworth and the existing Wentworth Hospital will experience widespread inundation during flood events as frequent as a 5% AEP flood. The existing network of levees around Wentworth will prevent flooding of the main residential and commercial areas during events up to an including a 1% AEP flood. During floods exceeding a 1% AEP event, the Curlwaa Levee is first overtopped, followed by the Wentworth Town Levee, Wentworth East Levee and finally the Hospital Levee.

Consultation has been undertaken with Mr Marcus Wilson, the Disaster Manager for the Lower Health District (LHD), to understand the emergency response protocols that would be followed over the course of a major flood event. This includes information such as the most likely evacuation destinations and the organisations with whom co-ordination will be required.

The following evacuation protocols were discussed during this consultation.

- Evacuation of the Wentworth Hospital would likely first be directed to the Wentworth Airfield followed by either the Mildura Airport or to the Mildura Base Hospital.
- Evacuation to the airports would be undertaken to transport patients to alternate facilities outside of the Wentworth Local Government Area (LGA) in advance of the oncoming flood. The Wentworth Airport is the preferred location for evacuation by air.
- Evacuation to the Mildura Base Hospital would also be an option. However, this would require close communication between Wentworth and Mildura Hospital to confirm there is sufficient resources and capacity to assist. This option may not be possible given existing resources and capacity may already be low and stretched given the severity of the flood situation that would be unfolding.

The potential evacuation routes and warning times based on evacuation to the Wentworth Airport and to Mildura are outlined in the following sections.

4.3.1 Evacuation to Wentworth Airfield (Option 1)

The Wentworth Airfield is located four (4) kilometres north-west of Wentworth Hospital. As shown in **Figure 21**, the Wentworth Airfield can be accessed by following Hospital Road onto the Silver City Highway, before crossing over the Darling River and continuing through Wentworth Town via Adams Street to Renmark Road. This is the nominated evacuation route to reach the airfield.

Light Detection and Ranging (LiDAR) survey indicates that elevations along the evacuation route are lowest along Renmark Road. A low-point exists along Renmark Road about 720 metres west of the turn off from the Silver City Highway (*refer to Point X on* **Figure 21**). The low-point has a crest elevation of about 33.8 mAHD.

Flood modelling undertaken as part of the *Wentworth Flood Study* (*Rev D, July 2021*) indicates that the evacuation route will remain dry until around the peak of a 5% AEP event. As shown in **Table 4.1**, the low point along Renmark Road would be overtopped by up to 0.02 metres at the peak of a 5% AEP flood. Depths of inundation over Renmark Road increase to 0.8 metres at the peak of a 1 in 200 AEP event.

Predicted flood extents along the evacuation route for the 5%, 1% and 1 in 200 AEP events are shown in **Figure 22**. The location of the critical low point is marked on the figure.

Table 4.1 Predicted Flood Levels and Overtopping Depths at the Low-Point on Renmark Road

Event (AEP)	**Peak Flood Level** (mAHD)	**Depth of Overtopping** ^ (m)
5%	33.82	0.02
1%	34.42	0.62
1 in 200	34.60	0.80
Extreme Flood	35.42	1.62

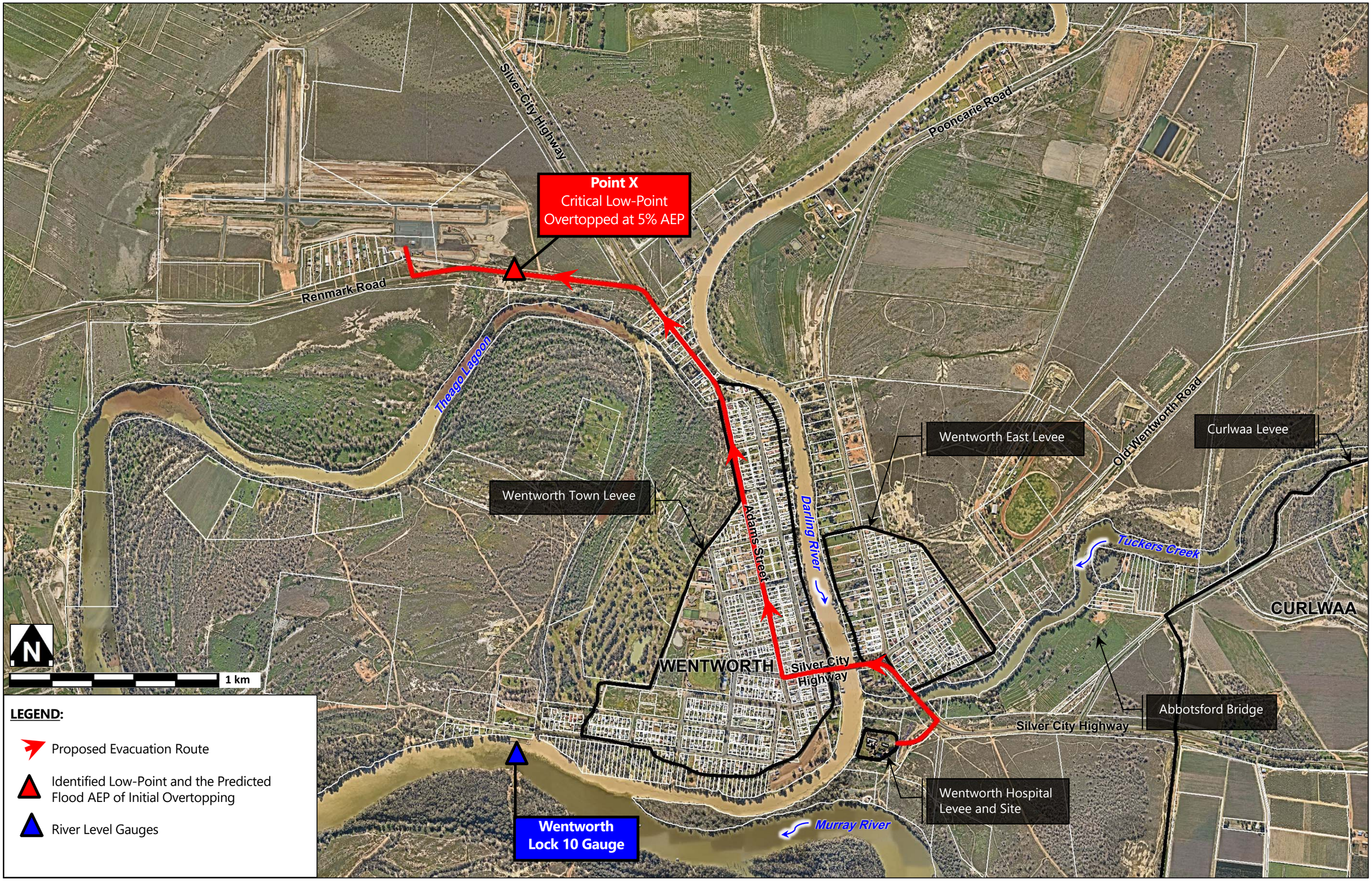
^ *Based on a minimum crest elevation of 33.8 mAHD along Renmark Road.*

4.3.2 Evacuation towards Mildura (Option 2)

Evacuation to Mildura is recommended based on it being a large regional city with hospital facilities and an airport for onward travel, if necessary. As shown in **Figure 23**, the majority of Mildura is also predicted to remain flood free during floods up to and including the adopted extreme event. The only other towns that are nearby and predicted to remain unaffected by flooding are Dareton and Merbein within NSW and Victoria, respectively.

There are two possible evacuation routes to Mildura which both follow the same initial route through Curlwaa via the Silver City Highway. As shown in **Figure 23**, the evacuation routes diverge west of the Abbotsford Bridge, with the southern route continuing east onto the Calder Highway then over Abbotsford Bridge towards Merbein, and the northern route turning north-east and continuing on the Silver City Highway towards Dareton.

The travel distance to reach Dareton, Merbein and Mildura is listed in **Table 4.2** for each evacuation route.



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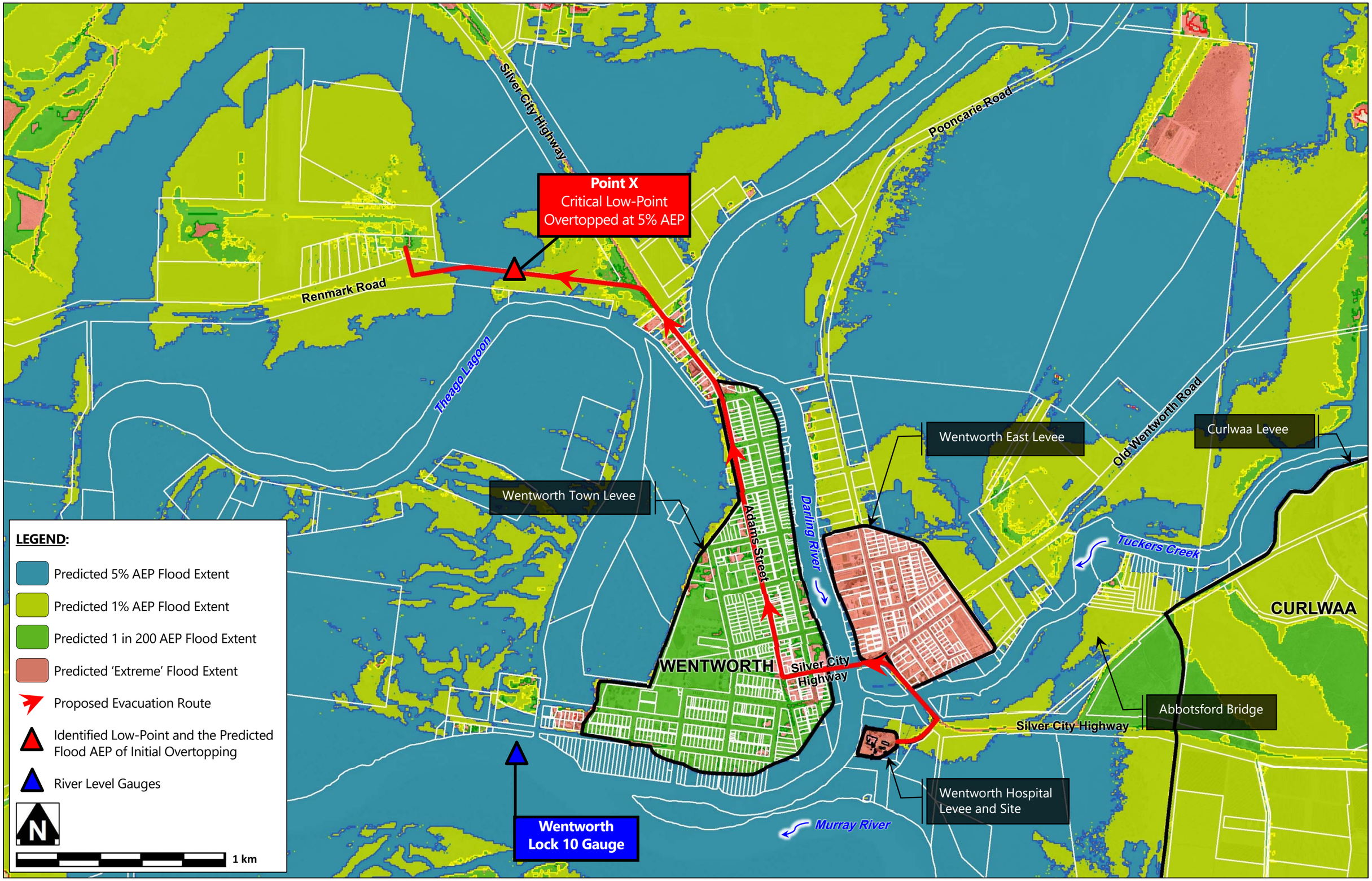
EVACUATION ROUTE FROM THE WENTWORTH HOSPITAL TO WENTWORTH AIRFIELD
[With Aerial Photograph]



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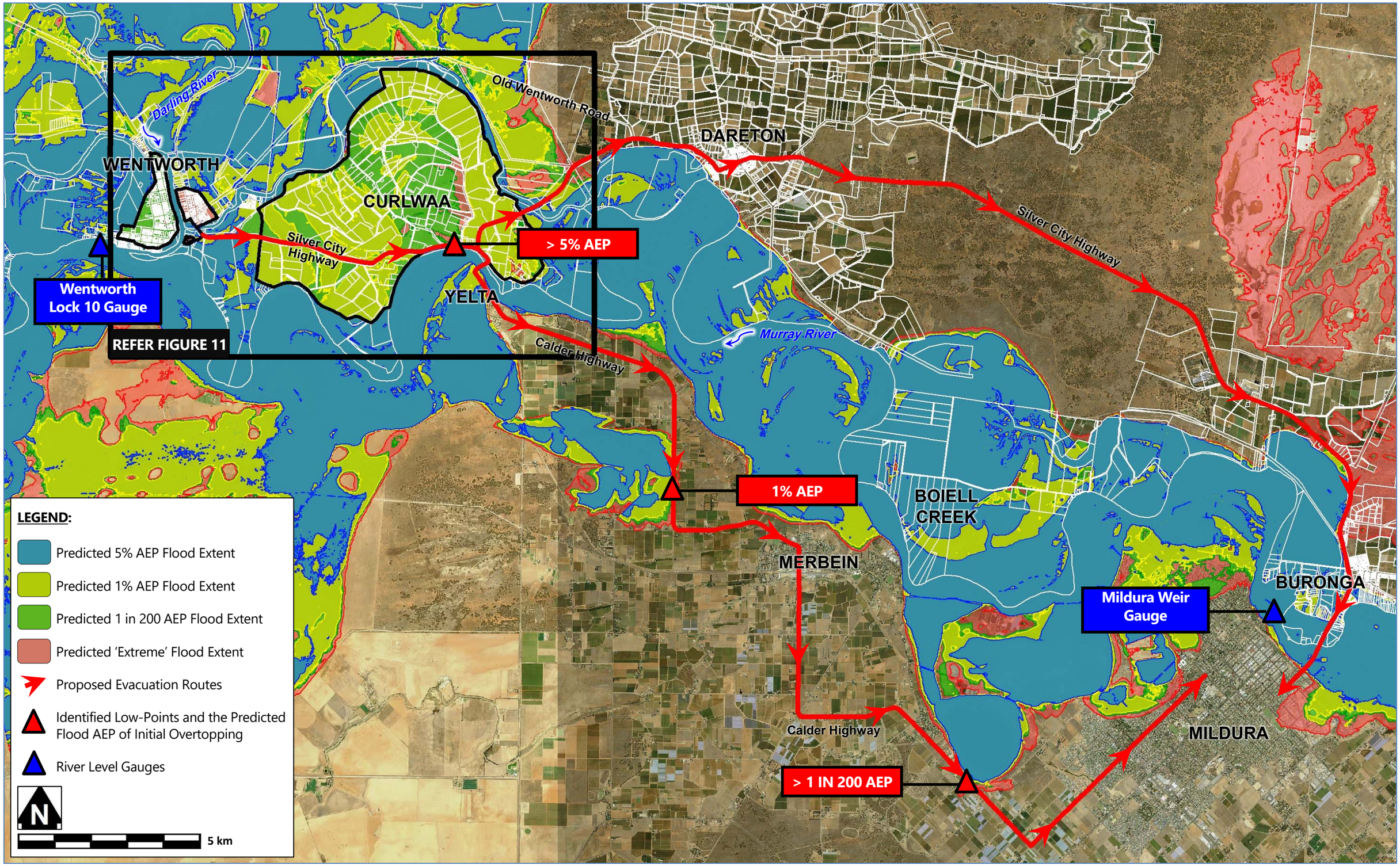
EVACUATION ROUTE FROM THE WENTWORTH HOSPITAL TO WENTWORTH AIRFIELD
[With Predicted Flood Extents]



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EVACUATION ROUTES FROM THE WENTWORTH HOSPITAL TO MILDURA
[OVERVIEW]

Table 4.2 Travel Distance to Mildura, Dareton and Merbein

Destination	Northern Route	Southern Route
Dareton	12.5 km	Not Applicable
Merbein	Not Applicable	17.5 km
Mildura	30 km	36 km

The potential for overtopping of the Curlwaa Levee is a critical constraint to both evacuation routes to Mildura, and in general for evacuation from the wider Wentworth area. Modelling undertaken for the *Wentworth Flood Study* (*Rev D, July 2021*) indicates that the Curlwaa Levee is overtopped at a low-point located on the Calder Highway between the Abbotsford Bridge crossing of the Murray River (*near Yelta*) and the intersection of the Calder Highway with the Silver City Highway (*refer Point A indicated in* **Figure 24**).

The modelling indicates that the Curlwaa Levee would be overtopped at Point A at about the peak of the 5% AEP flood. The elevation of the Calder Highway at the low-point at Point A is 35.55 mAHD based on available LiDAR survey.

Floodwaters overtopping the Curlwaa Levee at Point A are expected to lead to inundation of low-lying sections of the Calder Highway before spreading across the Curlwaa floodplain and overtopping the Silver City Highway (*refer Point B in* **Figure 24**).

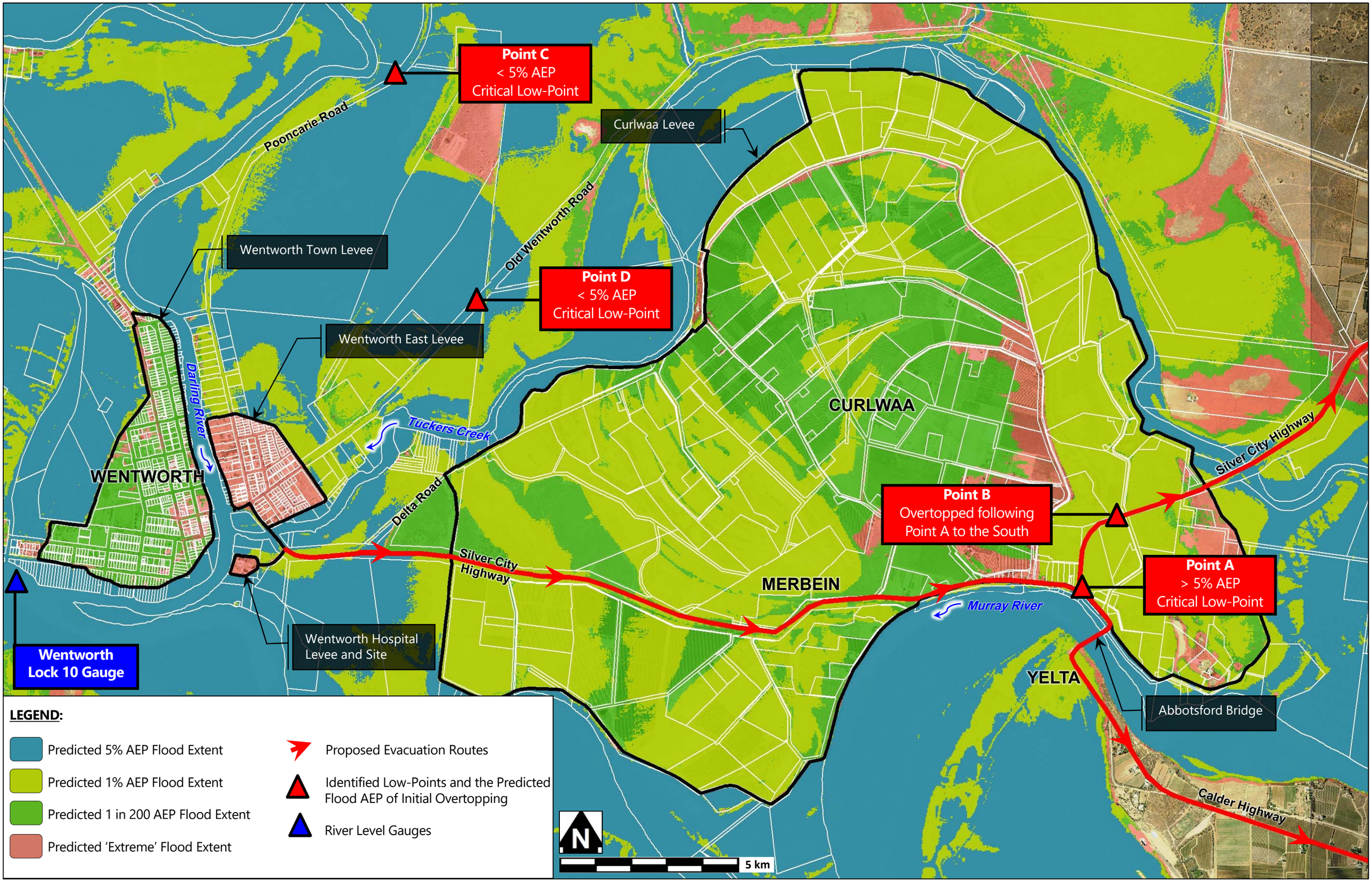
The modelling indicates that around the same time that the low-point A is overtopped, additional overtopping is predicted to commence at other locations along the Curlwaa Levee, which would serve to increase the rate-of-rise of floodwaters across the floodplain inside the levee. The next low-points along the Curlwaa Levee expected to overtop are located downstream of the Abbotsford Bridge along Williamsville Road. Accordingly, evacuation through Curlwaa via both routes will no longer be a safe and reliable option once the low-point at Point A is overtopped.

4.4 Flood Warning Analysis

The Murray-Darling River system consists of large catchments, long rivers and significant volumes of floodplain storage. Significant floods, such as in 1956 and 1974, led to inundation of the region for several months each time. Floodwaters arrived with advanced warning in the order of weeks and rose gradually once reaching Wentworth.

These characteristics of flooding along the Murray-Darling River system makes emergency response planning unique compared to other river systems. Whereas evacuation is typically constrained by an inability to obtain sufficient and effective warning time, the Murray River system has such abundant warning time that complacency becomes a risk to the community.

The following review of available warning time for site preparation and evacuation is based on the rate-of-rise of floodwaters during a 1% AEP event and the adopted 'extreme' flood. Warning times are assessed based on the monitoring of real-time river height data available from the Wentworth Lock 10 river gauge which the State Emergency Services (SES) rely on for the dissemination of flood warnings.



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EVACUATION ROUTES FROM THE WENTWORTH HOSPITAL TO MILDURA
[EVACUATION THROUGH CRITICAL LOW-POINT]

4.4.1 River Level Gauges

The '*Wentworth Shire Flood Emergency Sub Plan*' (*2018*) was prepared by the NSW State Emergency Services (SES). It identifies the river level gauges listed in **Table 4.3** as being actively monitored by the Bureau of Meteorology (BOM) for the dissemination of flood warnings and for determining height-time predictions. The river distance from each gauge to Wentworth is also provided.

Table 4.3 River Level Gauges Relied Upon by BOM for Flood Warnings

River System	Gauge Site and Number	Owner	Distance Upstream from Wentworth	Flood Warning Heights ^		
				Minor	Moderate	Major
Murray River	Euston Weir Downstream (414203)	VIC	285 km	50.9 mAHD	51.6 mAHD	52.1 mAHD
	Mildura Weir Upstream (414202)	VIC	53 km	36.0 mAHD	37.5 mAHD	38.5 mAHD
	Wentworth Weir (Lock 10) (425992)	BOM	0 km	32.1 mAHD	32.7 mAHD	33.9 mAHD
Darling River	Menindee (425001)	DWR	710 km	8.5	9.1	9.7
	Pooncarie (425005)	BOM	320 km	6.8	7.6	8.7
	Burtundy (425007)	DWR	180 km	6.1	/	7.7

^ *Gauge heights are to a local height datum unless otherwise noted.*

River level data for each of the gauges listed in **Table 4.3** along the Murray River can be accessed via the BOM website using the following links:

- Euston Weir Downstream - http://www.bom.gov.au/fwo/IDN60237/IDN60237.049115.plt.shtml
- Mildura Weir Upstream - http://www.bom.gov.au/fwo/IDN60237/IDN60237.076124.plt.shtml
- Wentworth Weir (Lock 10) - http://www.bom.gov.au/fwo/IDN60237/IDN60237.047100.plt.shtml

River level data for each of the gauges listed in **Table 4.3** along the Darling River can be accessed via the BOM website using the following links:

- Pooncarie - http://www.bom.gov.au/fwo/IDN60238/IDN60238.047103.plt.shtml
- Burtundy - http://www.bom.gov.au/fwo/IDN60238/IDN60238.547015.plt.shtml
- Menindee Town - http://www.bom.gov.au/fwo/IDN60238/IDN60238.047101.plt.shtml

The nearest river level gauge to the Wentworth Hospital is the Wentworth Weir (Lock 10) gauge. Due to its close proximity there is very little difference between flood heights recorded at the gauge and those experienced upstream at the site. This is reinforced by the flood level mapping shown in **Figures 4** to **7** which indicates the maximum difference between flood levels at the Lock 10 gauge and the Wentworth Hospital is only 0.3 metres; which occurs during the 'extreme' event. During the 1% AEP flood the difference in levels reduces to 0.17 metres (*refer* **Figure 5**).

River level data recorded at the Wentworth Weir (Lock 10) gauge will be critical for evacuation planning and decision making. Gauges upstream of the hospital site such as Euston Weir (*Downstream*) (*414203*) along the Murray River and Pooncarie (*425005*) along the Darling River are important on the basis that they can provide advanced warning and provide an early indication of the size of the event and stage of the flood cycle.

It is worth noting that the moderate and major gauge heights assigned to the Wentworth Weir (Lock 10) gauge (refer **Table 4.3**) are similar to the peak flood levels predicted for a 5% and 20% AEP events, respectively.

4.4.2 Available Warning for Evacuation

As discussed in **Section 4.3**, there are two destinations to which evacuation from the Wentworth Hospital would be directed. These are the Wentworth Airfield (Option 1) and road travel to Mildura (Option 2).

The available flood warning times can be determined for each evacuation route based on the elevation of low-points along each route and the rate-of-rise of floodwaters at these low-points and at the Wentworth Weir (Lock 10) gauge. As discussed above, the Lock 10 gauge is relied upon by the SES and BOM for the dissemination of flood warnings.

It is worth noting that advanced warning times could be achieved for the Murray River if flood levels were also monitored at the Euston Weir (Downstream) gauge or for the Darling River if flood levels were monitored at the Pooncarie gauge. An alternative to this would be to monitor flood warnings and flood bulletins issued by the SES and BOM. These updates typically provide a good overview of the flood event including projections of the height and timing of the flood peak at key locations such as at Wentworth and the Wentworth Weir (Lock 10) gauge.

The available warning times before evacuation is no longer possible to the Wentworth Airfield and to Mildura are discussed in the following.

Option 1 – Evacuation to the Wentworth Airfield

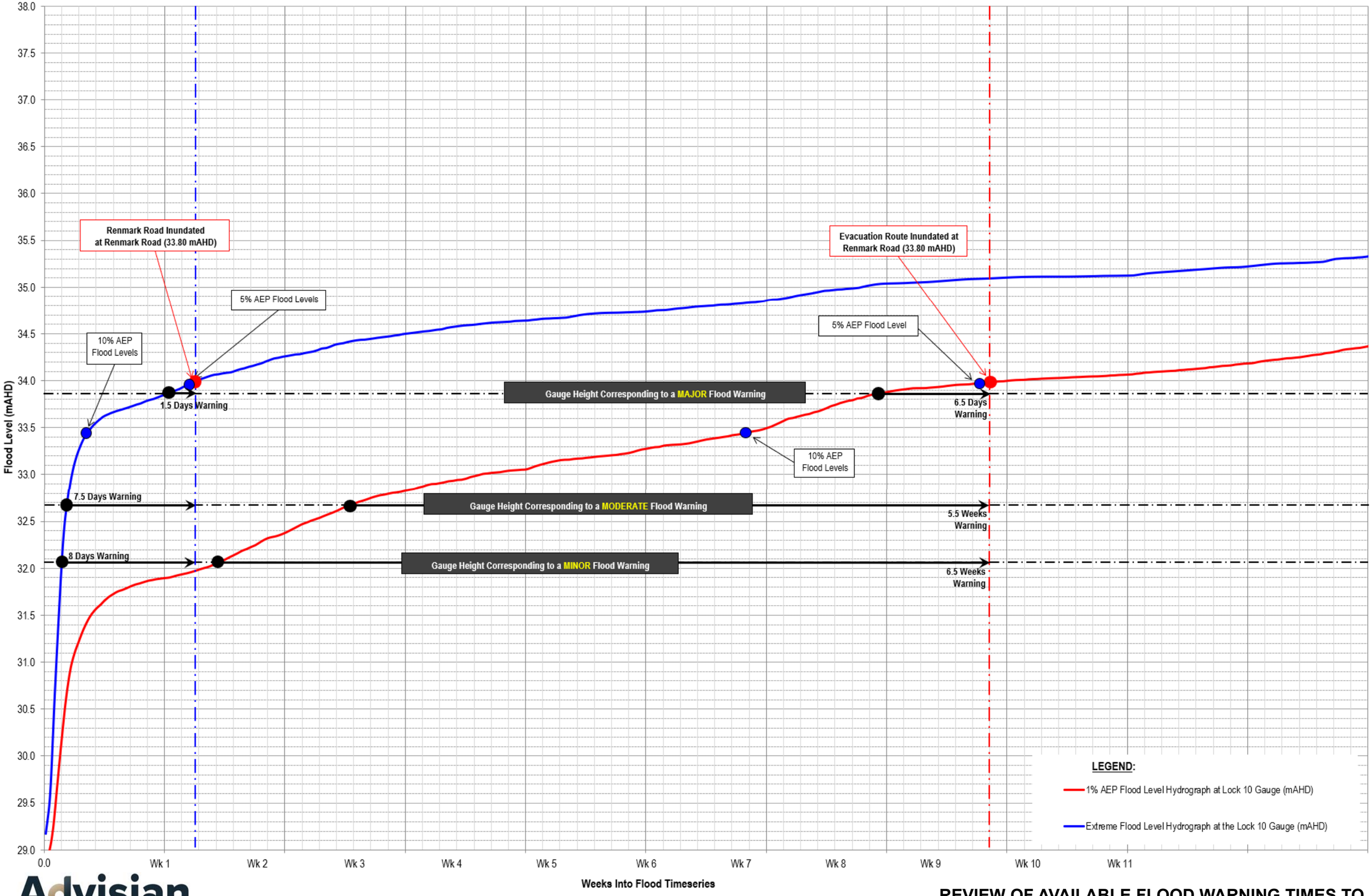
As discussed above, the preferred evacuation route towards the Wentworth Airfield starts to become inundated near the peak of a 5% AEP flood. Once this occurs, floodwaters will start to overtop Renmark Road at the location identified as "Point X" in **Figure 21**. Accordingly, evacuation of the Wentworth Hospital to the Wentworth Airfield by vehicle will no longer be possible once this occurs.

Analysis of the modelling results for the 1% AEP and extreme events shows that flood levels at the low-point along Renmark Road are around 0.2 metres lower than those predicted at the Wentworth Weir (Lock 10) gauge. This indicates that Renmark Road would overtop once flood levels at the gauge reach a level of around 34.0 mAHD. This level aligns closely with the predicted peak of a 5% AEP event.

Flood level (or stage) hydrographs at the Wentworth Weir (Lock 10) gauge are plotted in **Figure 25** for the 1% AEP flood and for the 'extreme' event. Although the 1% AEP event provides a more realistic assessment of flood warning times, consideration of the extreme event ensures that a conservative assessment has been undertaken because the rate-of-rise in the extreme flood is substantially faster than for the more frequent or smaller flood events (refer **Figure 25**).

As shown, the cut-off for evacuation has been set to the time at which levels at the gauge reach 34.0 mAHD, which coincides with a peak flood level of around 33.8 mAHD at Renmark Road.

FIGURE 25



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REVIEW OF AVAILABLE FLOOD WARNING TIMES TO EVACUATE TO THE WENTWORTH AIRFIELD BASED ON THE 1% AEP AND EXTREME FLOOD EVENTS

Table 4.4 summarises the predicted warning times available for evacuation based on the predicted flood level hydrographs exported for the 1% AEP event and the extreme event. All warning times are provided for the time up to overtopping of Renmark Road at the low-point identified as "Point X" on **Figure 21**.

Table 4.4 Flood Warning Assessment for Evacuation to the Wentworth Airfield Based on Monitoring Flood Levels at the Wentworth Weir (Lock 10) gauge

Event	Elevation of Low-Point (*mAHD*)	Available Warning Time		
		Minor Flood level Reached (*32.1 mAHD*)	Moderate Flood level Reached (*32.7 mAHD*)	Major Flood level Reached (*33.9 mAHD*)
1% AEP	33.80	45 days (6.5 weeks)	38 days (5.5 weeks)	6.5 days (~1 week)
Extreme Flood	33.80	8 days (~1 week)	7.5 days (~1 week)	1.5 days

The analysis presented in **Table 4.4** and shown as **Figure 25** indicates that significant warning time in the order of 1 week would be available even if the rate-of-rise for an extreme event is adopted and evacuation is not actioned until receipt of a Moderate flood warning. The warning time reduces to 1½ days if evacuation is not actioned until receipt of a Major flood warning. The available warning time would more than double to 2½ weeks if the analysis were based on the rate of rise predicted for the 1% AEP event.

The limited warning time available following receipt of a Major flood warning may make evacuation to the Wentworth Airfield difficult. This is because evacuation would not be complete upon arrival at the airfield. Complete evacuation will require patients to be loaded onto aircraft and for the associated aircraft to taxi and complete a successful take-off. Delaying evacuation to the Wentworth Airport until a Major flood warning is issued could lead to isolation of hospital patients at the airport if logistical issues associated with loading and take-off play out. Isolation could occur if Renmark Road is overtopped after those evacuating had reached the airfield and if aircraft take-off could not be effected before runway inundation.

Based on the above, it is recommended that any plans to use the Wentworth Airfield for evacuation be completed before the Major gauge level is reached at the Wentworth Weir (Lock 10) gauge.

Accordingly, evacuation should be commenced once a Moderate flood warning is issued. This would provide between 7½ and 38 days to organise and complete the aerial evacuation.

The steep rate-of-rise in the extreme event between the Minor and Moderate warning levels makes it critical that advanced warning be obtained by monitoring flood bulletins and flood watches. This advanced warning could be used as a trigger for preparation and planning which could involve the re-scheduling of medical procedures and appointments, organising staff and supplies and liaising with the Wentworth Airfield.

Option 2 – Evacuation to Mildura

The alternate evacuation destination towards Mildura, through Curlwaa and then either Dareton or Merbein, will be 'cut' once the low-point along the Curlwaa Levee is overtopped. Once this occurs, floodwaters would inundate parts of the Calder Highway and the Silver City Highway, thereby preventing evacuation by motor vehicle. Accordingly, evacuation of the Wentworth Hospital by vehicle will no longer be possible once this occurs.

Flood level (or stage) hydrographs at the low-point along the Curlwaa Levee and at the Wentworth Weir (Lock 10) gauge are plotted in **Figure 26**. Flood level hydrographs have been extracted from the modelling for the 1% AEP flood and for the 'extreme' event.

Table 4.5 summarises the predicted warning times available for evacuation based on the predicted flood level hydrographs exported for the 1% AEP event and the extreme event. All warning times are provided for the time up to overtopping of the Curlwaa Levee, at which point the evacuation routes would soon be at risk of inundation and considered unsafe for evacuation of patients or staff from the hospital.

Table 4.5 Flood Warning Assessment for Evacuation towards Mildura Based on Monitoring Flood Levels at the Wentworth Weir (Lock 10) gauge

Event	Elevation of Low-Point *(mAHD)*	Available Warning Time		
		Minor Flood level Reached (*32.1mAHD*)	Moderate Flood level Reached (*32.7mAHD*)	Major Flood level Reached (*33.9mAHD*)
1% AEP	35.55	52 days (7.5 weeks)	45 days (6.5 weeks)	18 days (2.5 weeks)
Extreme Flood	35.55	14 days (2 weeks)	13.5 days (2 weeks)	7.5 days (~1 week)

The analysis presented in **Table 4.5** and shown as **Figure 26** indicates that significant warning time in the order of 1 week would be available even if the rate-of-rise for an extreme event is adopted and evacuation is not actioned until receipt of a major flood warning. The available warning time would more than double to 2.5 weeks if the analysis were based on the 1% AEP event.

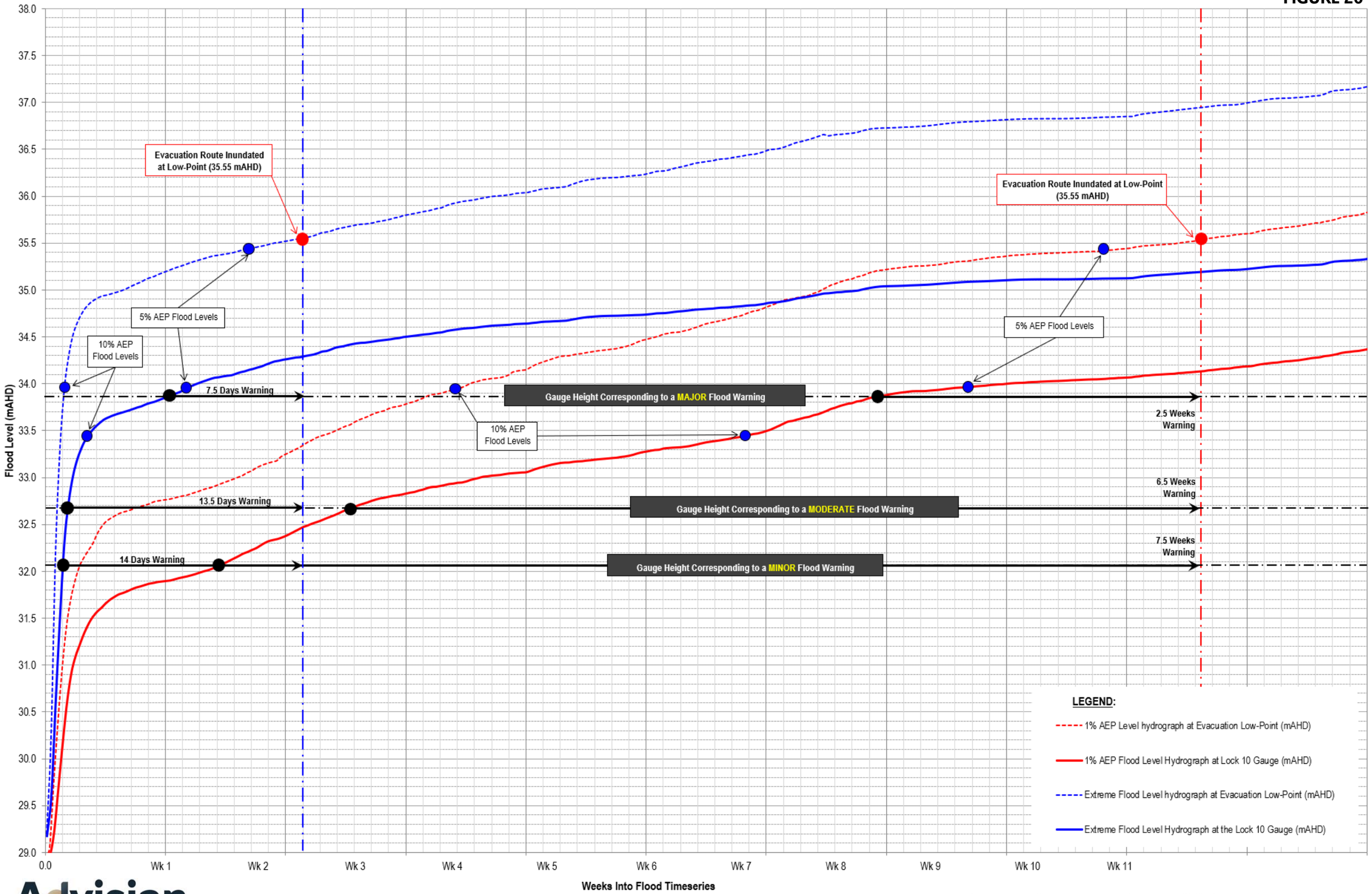
The significant warning time available following receipt of a major flood warning indicates that a final decision to evacuate the hospital towards Mildura would not need to be made before this time. Minor and moderate warnings could therefore be used as triggers for preparation and planning, which could involve the re-scheduling of medical procedures and appointments, organising staff and supplies.

Even if these planning steps are not commenced until receipt of a moderate flood warning there would still be between 1 and 4 weeks before a major flood warning could be expected.

4.4.3 Available Warning Before Site Inundation

The mapping of flood extents and levels presented as **Figures 4** to **7** shows that the hospital site is predicted to remain flood free during events up to and including a 1 in 200 AEP flood. The evacuation routes to the Wentworth Airfield or to Mildura are predicted to be overtopped during floods exceeding the 5% AEP event.

FIGURE 26



Advisian
Worley Group

311015-00304 – Wentworth Hospital Redevelopment
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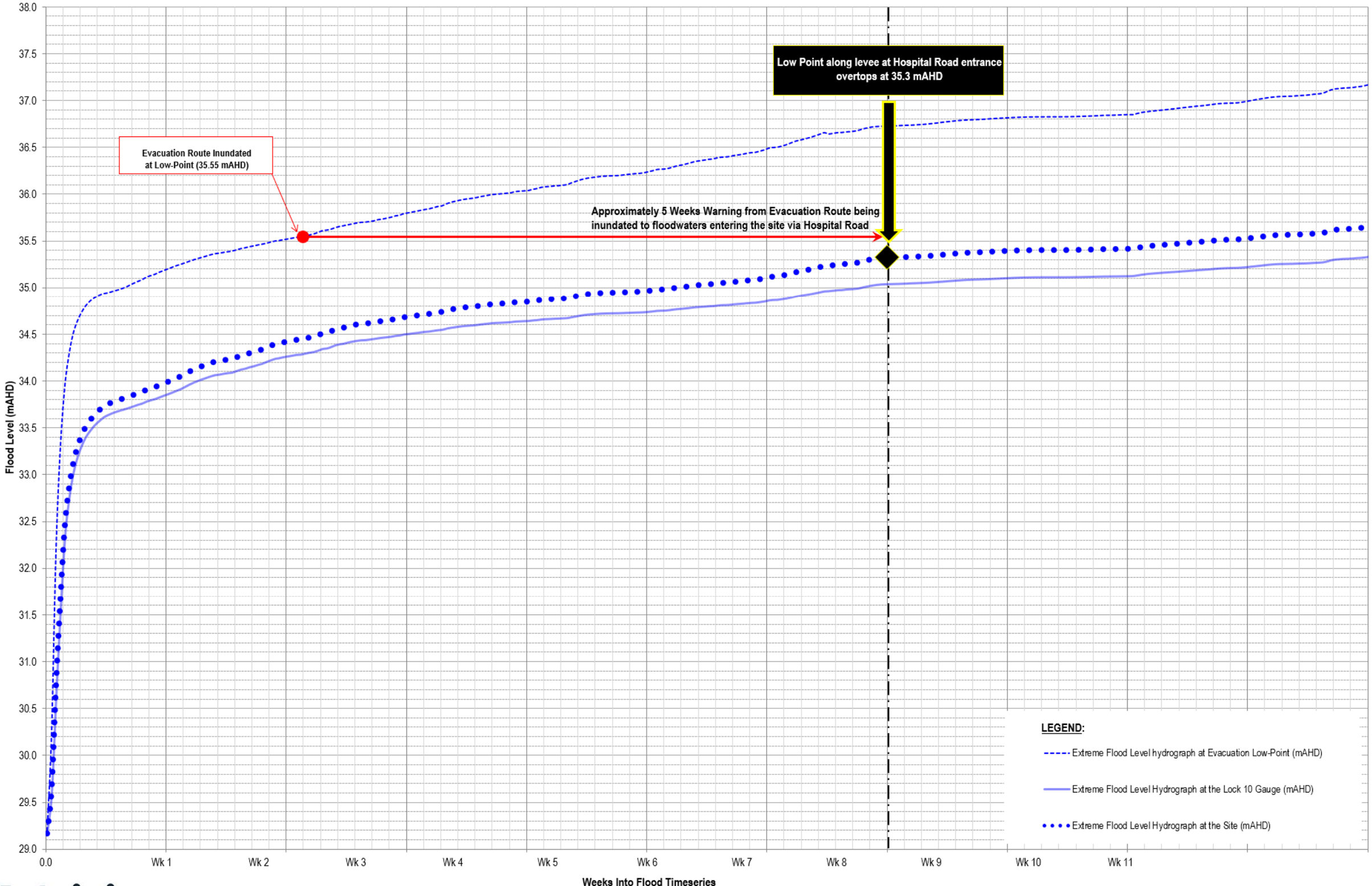
REVIEW OF AVAILABLE FLOOD WARNING TIMES TO EVACUATE TO MILDURA BASED ON THE 1% AEP AND EXTREME FLOOD EVENTS

The length of time between overtopping of the evacuation route to Mildura and inundation of the site can be extrapolated from the flood level hydrographs shown in **Figure 27**. The difference in time is based on the rate-of-rise of flood levels at the site and at the low-point along the Curlwaa Levee (*refer Point A in* **Figure 24**). The 1% AEP flood has been excluded from this plot as the site is not inundated during this event.

As shown in **Figure 27**, there is predicted to be almost 5 weeks (*34 days*) between when the evacuation route is inundated by floodwaters overtopping the Curlwaa Levee and floodwaters reaching the low-point at the Hospital Road entrance to the site. As discussed above, there is a "gap" in the Hospital Levee at Hospital Road which has a minimum crest elevation of 35.3 mAHD.

The significant difference in time means that the hospital and the site itself will not be in any immediate risk in the short term after the available evacuation routes to Mildura are cut by floodwaters. During this time, access to the Wentworth town centre would still be possible.

The 5 weeks of additional warning time could be used to further safeguard the hospital or to organise and complete further evacuations via helicopter or boat. This is considered to be a fall-back position and is not a strategy that is recommended to be incorporated as part of the emergency response management plan for the hospital.



Advisian
Worley Group

311015-00304 – Wentworth Hospital Redevelopment
Fg311015-00304_220817_Wentworth Hospital FIRA_A3L.pptx

REVIEW OF AVAILABLE FLOOD WARNING TIMES BETWEEN INUNDATION OF THE EVACUATION ROUTE AND FLOODWATERS INUNDATING THE HOSPITAL SITE

5 Flood Emergency Response Procedures

A standalone Flood Emergency Response Plan (FERP) has been prepared by Advisian to mitigate the flood risks identified in **Section 4**. The FERP (2023) includes detailed information on the following:

- Awareness and preparation of staff and resources;
- Flood emergency response triggers and actions; and,
- Flood recovery and clean-up.

6 Compliance with Planning Guidelines and Controls

6.1 Wentworth Local Environmental Plan 2011

The proposed development is considered compliant with the relevant clauses in Section 5.21 – Flood Planning of the Wentworth LEP 2011. It has been demonstrated that:

- The development is not located within the Flood Planning Area, which is defined as the area of land below the Flood Planning Level (1% AEP level plus 750 mm).
- The development is compatible with the flood function of the land, not being positioned in any floodway or flood storage area.
- There will be no adverse impacts on flood behaviour during events up to and including the 1 in 200 AEP flood. The potential impact during the adopted 'extreme' event is considered insignificant.
- Evacuation of people from the site in the event of a flood will be possible with adequate warning time.
- The development will incorporate measures to manage the risk to life in the event of a flood, and otherwise does not involve significantly increasing the number of inpatient beds.

6.2 Wentworth Shire Development Control Plan 2011

The proposed development is considered compliant with the relevant clauses in Section 4 (Chapter 3) of the Wentworth Shire DCP. It has been demonstrated that:

- The proposed development and earthworks mound will be above the adopted 'extreme' flood level and more than 1 metre above the 1% AEP flood level in areas surrounding the existing Hospital Levee.
- The development is not positioned within any floodway or flood storage area.
- There will be no adverse impacts on flood behaviour during events up to and including the 1 in 200 AEP flood. The potential impact during the adopted 'extreme' event is considered insignificant, including the reduction in flood storage volume and the potential to cause any erosion or increase in flood velocities.
- A detailed Flood Emergency Response Plan has been prepared for the development (Advisian, 2023).

6.3 State Environmental Planning Policy (Biodiversity and Conservation) 2021

The proposed development is considered compliant with the relevant clauses and objectives in Chapter 5 – River Murray Lands of the Biodiversity and Conservation SEPP. It has been demonstrated that:

- The proposed development will not lead to any redistribution of floodwaters during floods up to and including the 1 in 200 AEP flood.

- Raising the floor level of the proposed main hospital building to be above the peak flood level predicted for an extreme flood event reduces the flood risks to the asset compared to existing hospital. This will result in a reduction in the pollution threat of the hospital site during the full range of flood events.
- The proposed development will result in no additional risk of cumulative impacts during the full range of flood events.
- The cost of replacing infrastructure is reduced compared to existing conditions by ensuring the main hospital building will have FFLs that are above the predicted peak extreme flood level. The proposed hospital building will have FFLs that are between 0.8 and 1.6 metres above those for the existing hospital building that is to be replaced.

7 Conclusions

The above investigations have assessed the potential impact of the proposed development on flood conditions and the potential flood risk to staff and patients, and how this can be effectively managed.

The following conclusions are made.

(i) The proposed hospital main building will be constructed on a fill mound with minimum Finished Floor Levels (FFLs) above the predicted 'extreme' flood level of 36.0 mAHD. This will ensure the building is not at risk of overfloor flooding.

(ii) The development will not result in any adverse impacts on flood behaviour during events up to and including the 1 in 200 AEP flood. The potential impact during the adopted 'extreme' event is considered insignificant.

(iii) Three evacuation routes to two destinations have been identified for the hospital that are recommended in the event of a major flood event. The preferred evacuation route is to the Wentworth Airfield, which will remain flood-free until the 5% AEP flood level is reached.

(iv) The other two evacuation routes require travel through Curlwaa via the Silver City Highway and the Calder Highway. A low-point along the Curlwaa Levee results in the evacuation route being at risk of inundation during floods exceeding a 5% AEP event.

(v) Any staff or visitors to the hospital site must evacuate before these low-points are overtopped to avoid being isolated and restricted in their movements beyond Wentworth.

(vi) The analysis of flood warning times has shown that there should be sufficient time available to allow preparation of the hospital and evacuation of patients and staff, if necessary.

(vii) About 1 to 2.5 weeks of warning time is available before the evacuation routes are cut if a response is triggered by the major flood level at the Wentworth Weir gauge and adopting a rate-of-rise similar to the 1% AEP event.

(viii) If adopting a rate-of-rise similar to the 'extreme' event, a response triggered by the moderate flood level would provide 1 to 2 weeks of warning time.

(ix) Adopting a rate-of-rise similar to the 'extreme' event indicates that there would be approximately 5 weeks of warning time from evacuation routes being 'cut' and floodwaters reaching a sufficient elevation to breach the Hospital Levee system.

(x) The proposed development is considered compliant with the relevant planning and development controls outlined in the Wentworth LEP and DCP.

A standalone Flood Emergency Response Plan (FERP) has been prepared by Advisian to mitigate the flood risks identified in **Section 4**. The FERP (2023) includes detailed information on the following:

- Awareness and preparation of staff and resources;
- Flood emergency response triggers and actions; and,
- Flood recovery and clean-up.

8 Document Register

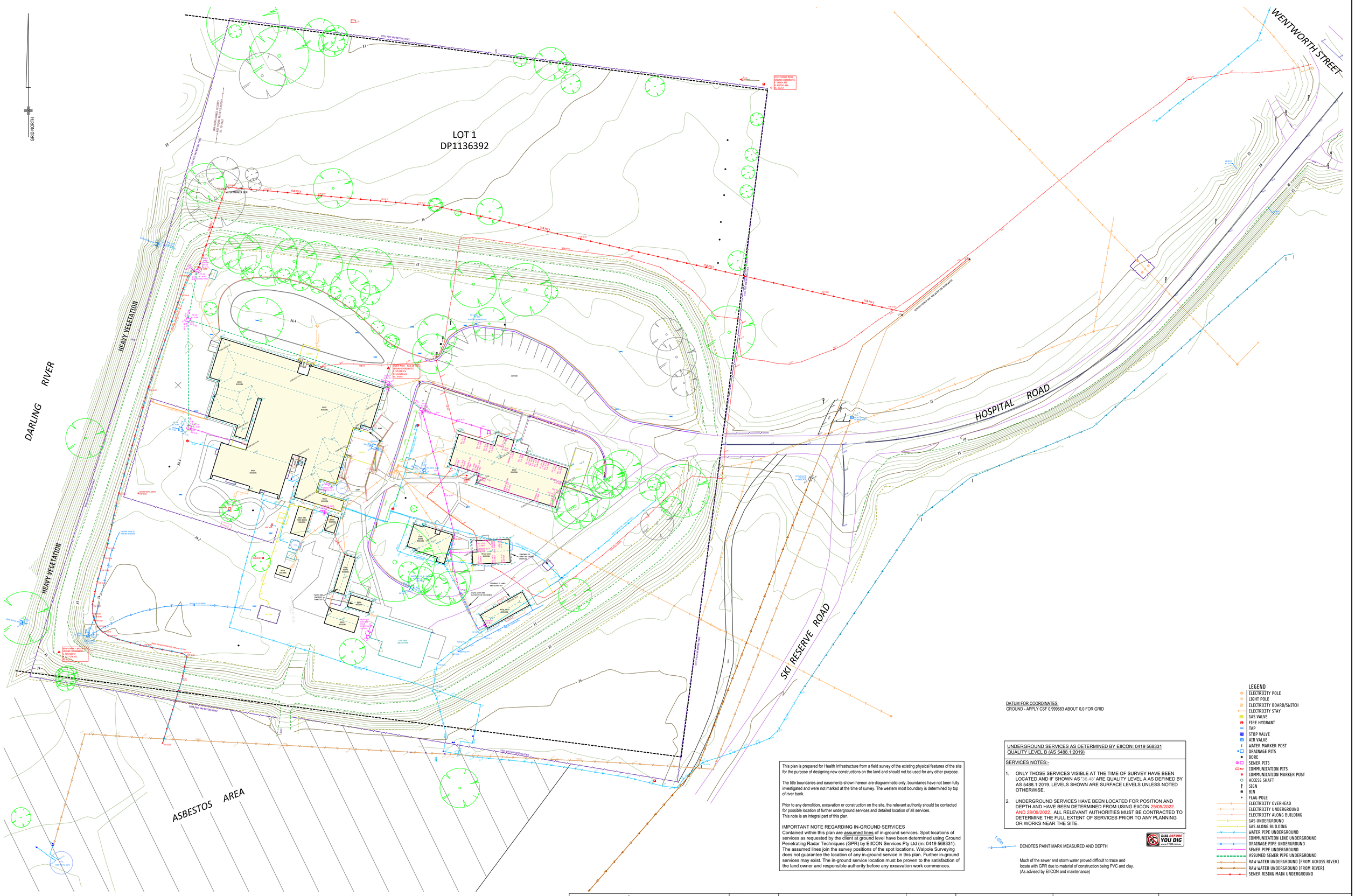
This Flood Impact and Risk Assessment (FIRA) report has been prepared based on the following documents:

- Walpole Surveying – Wentworth Health Services Redevelopment – Plan of Features and Levels – Surveyors Reference 22072 Version 4 07/10/2022.
- Taylor Thomson Whitting (NSW) Pty Ltd – Wentworth Health Services Redevelopment – Civil REF Drawings Package issued 12/04/2023.
- NBRS & Partners Pty Ltd – Wentworth Health Services Redevelopment – Schematic Design report, Revision 4
- NBRS & Partners Pty Ltd – Wentworth Health Services Redevelopment – Architectural REF Drawings Package issued 12/04/2023.
- NBRS & Partners Pty Ltd – Wentworth Health Services Redevelopment – Landscape REF Drawings Package issued 17/04/2023.

9 References

- Advisian (*2022*), '*Wentworth Hospital Redevelopment; Preliminary Flood Assessment*', prepared for Health Infrastructure.
- Advisian (*2023*), '*Wentworth Hospital Redevelopment; Flood Emergency Response Plan*', prepared for Health Infrastructure.
- Australian Institute for Disaster Resilience (*2017*), '*Australian Disaster Resilience Handbook 7 Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia*'; © Commonwealth of Australia 2017 third edition.
- Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), (*2019*), *'Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia*'
- Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), (*2019*), *'Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia – Book 8 – Estimation of Very Rare to Extreme Floods*'
- *Molino Stewart Pty Ltd* (*2013*), '*A Technical Guideline for the use of the SES Timeline Evacuation Model in Flood Evacuation', prepared by S. Molino*
- New South Wales Government (*2005*), *'Floodplain Development Manual: the management of flood liable land*'; ISBN 0 7347 5476 0.
- NSW State Emergency Service (*2018*) '*Wentworth Shire Local Flood Plan*'
- NSW State Emergency Service (*2004*) '*The Application of Timelines to Evacuation Planning*'
- Wentworth Shire Council (*July 2021*), '*Wentworth Local Environmental Plan (Kelso Station)*'; prepared by the NSW Department of Planning, Infrastructure and Environment.
- Wentworth Shire Council (*August 2021*), '*Planning Proposal for Lot 1 DP 1193874 Pooncarie Road, Wentworth*'; prepared by the NSW State Emergency Services.
- Wentworth Shire Council (*July 2021*), '*Wentworth Flood Study'*; (*Rev D, Final Draft*), prepared by the Advisian Pty Ltd.
- Wentworth Shire Council, '*Wentworth Shire Development Control Plan 2011*' (WSDCP 2011).

Appendix A
Wentworth Hospital Site Survey
(Prepared by Walpole Surveying)



DATUM FOR COORDINATES:
GROUND - APPLY CSF 0.999683 ABOUT 0,0 FOR GRID

UNDERGROUND SERVICES AS DETERMINED BY EIICON: 0419 568331
QUALITY LEVEL B (AS 5488.1:2019)

SERVICES NOTES:-

1. ONLY THOSE SERVICES VISIBLE AT THE TIME OF SURVEY HAVE BEEN LOCATED AND IF SHOWN AS "36.48" ARE QUALITY LEVEL A AS DEFINED BY AS 5488.1:2019. LEVELS SHOWN ARE SURFACE LEVELS UNLESS NOTED OTHERWISE.
2. UNDERGROUND SERVICES HAVE BEEN LOCATED FOR POSITION AND DEPTH AND HAVE BEEN DETERMINED FROM USING EIICON 25/05/2022 AND 28/09/2022. ALL RELEVANT AUTHORITIES MUST BE CONTRACTED TO DETERMINE THE FULL EXTENT OF SERVICES PRIOR TO ANY PLANNING OR WORKS NEAR THE SITE.

DIAL BEFORE YOU DIG www.1100.com.au

This plan is prepared for Health Infrastructure from a field survey of the existing physical features of the site for the purpose of designing new constructions on the land and should not be used for any other purpose.

The title boundaries and easements shown hereon are diagrammatic only, boundaries have not been fully investigated and were not marked at the time of survey. The western most boundary is determined by top of river bank.

Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed location of all services.
This note is an integral part of this plan.

IMPORTANT NOTE REGARDING IN-GROUND SERVICES
Contained within this plan are assumed lines of in-ground services. Spot locations of services as requested by the client at ground level have been determined using Ground Penetrating Radar Techniques (GPR) by EIICON Services Pty Ltd (m: 0419 568331). The assumed lines join the survey positions of the spot locations. Walpole Surveying does not guarantee the location of any in-ground service in this plan. Further in-ground services may exist. The in-ground service location must be proven to the satisfaction of the land owner and responsible authority before any excavation work commences.

LEGEND
- ELECTRICITY POLE
- LIGHT POLE
- ELECTRICITY BOARD/SWITCH
- ELECTRICITY STAY
- GAS VALVE
- FIRE HYDRANT
- TAP
- STOP VALVE
- AIR VALVE
- WATER MARKER POST
- DRAINAGE PITS
- BORE
- SEWER PITS
- COMMUNICATION PITS
- COMMUNICATION MARKER POST
- ACCESS SHAFT
- SIGN
- BIN
- FLAG POLE
- ELECTRICITY OVERHEAD
- ELECTRICITY UNDERGROUND
- ELECTRICITY ALONG BUILDING
- GAS UNDERGROUND
- GAS ALONG BUILDING
- WATER PIPE UNDERGROUND
- COMMUNICATION LINE UNDERGROUND
- DRAINAGE PIPE UNDERGROUND
- SEWER PIPE UNDERGROUND
- ASSUMED SEWER PIPE UNDERGROUND
- RAW WATER UNDERGROUND (FROM ACROSS RIVER)
- RAW WATER UNDERGROUND (FROM RIVER)
- SEWER RISING MAIN UNDERGROUND

WALPOLE SURVEYING
Licensed NSW & Victorian Cadastral and Engineering Surveyors
465 Smollett Street
PO Box 3186, Albury, NSW 2640
p: 02 6021 2233 | f: 02 6021 1411
info@walpolesurveying.com.au

SURVEYORS REF: 22072
VERSION 4
07/10/2022

SCALE
5 0 5 10 15 20 25
LENGTHS ARE IN METRES

ORIGINAL
SCALE 1:500 | SHEET SIZE A1

NOTES
DATE OF SURVEY: May 2022
DATUM FOR LEVELS: AHD Vide SSM49545
CONTOUR INTERVAL: 0.2m
TREES SHOWN ARE APPROXIMATELY TO SCALE

REVISION
Version 1 06-06-2022
Version 2 30-06-2022 (temporarily moved coordinates)
Version 3 18-08-2022 Sewer lines added (green)
Version 4 07-10-2022 Services by NDD investigations (27th-29th September) added

PLAN OF FEATURES AND LEVELS
WENTWORTH HEALTH SERVICE
24 Hospital Road, Wentworth
For Health Infrastructure

Appendix B Wentworth Health Service Redevelopment – Civil Plans

(Prepared by TTW)

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C002

WENTWORTH HEALTH SERVICE REDEVELOPMENT

24 HOSPITAL ROAD, WENTWORTH, NSW, 2648

CIVIL DRAWINGS

DRAWING LIST	
Drawing No.	Drawing Name
C001	COVER SHEET
C002	NOTES AND LEGENDS SHEET
C100	EROSION AND SEDIMENT CONTROL PLAN
C210	SITE PLAN
C310	PAVEMENT AND JOINTING PLAN
C410	CUT & FILL PLAN

DRAWINGS TO BE PRINTED IN COLOUR

Rev	Description	Eng	Draft	Date
2	REF ISSUE	RP	AE	11.04.23
1	ISSUED FOR SD	RP	AE	23.11.22

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BEWARE OF UNDERGROUND SERVICES.
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN

Project
WENTWORTH HEALTH SERVICE REDEVELOPMENT
24 HOSPITAL ROAD, WENTWORTH, NSW, 2648

Drawing Title
COVER SHEET

Architect
NBRS
+61 2 9922 2344 nbrs.com.au
Nominated Architect:
Andrew Duffin NSW 5602
NBRS & Partners Pty Ltd VIC 51197 ABN 16 002 247 565

Civil Engineer
TTW Structural Civil Traffic Façade
+61 2 9439 7288 | L6 73 Miller Street North Sydney NSW 2065

Scale: A1 Drawn: AE Authorised: RP

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Job No	Drawing No	Revision
221039	C001	2

Plot File Created: Apr 11, 2023 - 6:33pm

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C002

GENERAL NOTES

1. Contractor must verify all dimensions and existing levels on site prior to commencement of works. Any discrepancies to be reported to the ENGINEER
2. Strip all topsoil from the construction area. All stripped topsoil shall be disposed of off-site unless directed otherwise.
3. Make smooth connection with all existing works.
4. Compact subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1. Compaction under buildings to extend 2m minimum beyond building footprint.
5. All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority; the Contractor is to ensure that the drawings used for construction have been approved by all relevant authorities prior to commencement site.
6. All work on public property, property which is to become public property, or any work which is to come under the control of the Statutory Authority is to be carried out in accordance with the requirements of the relevant Authority. The Contractor shall obtain these requirements from the Authority. Where the requirements of the Authority are different to the drawings and specifications, the requirements of the Authority shall be applicable.
7. For all temporary batters refer to geotechnical recommendations.

REFERENCE DRAWINGS

1. These drawings have been based from, and to be read in conjunction with the following Consultants drawings. Any conflict to the drawings must be notified immediately to the Engineer.

Consultant	Dwg Title	Dwg No	Rev	Date
WALPOLE SVY	SURVEY	22072	4	07.10.22
NBRS	SITE PLAN - STAGE 1A	AR-0200	9	01.02.23
NBRS	SITE PLAN - STAGE 1B	AR-0201	9	01.02.23
NBRS	SITE PLAN - STAGE 2	AR-0202	9	01.02.23

SURVEY AND SERVICES INFORMATION

SURVEY

Origin of levels : CONTACT THE SURVEYOR
Datum of levels : A.H.D. VIDE SSM49545
Coordinate system : SURVEYOR TO CONFIRM
Survey prepared by : WALPOLE SVY
Setout Points : CONTACT THE SURVEYOR

Taylor Thomson Whitting does not guarantee that the survey information shown on these drawings is accurate and will accept no liability for any inaccuracies in the survey information provided to us from any cause whatsoever.

UNDERGROUND SERVICES - WARNING

The locations of underground services shown on Taylor Thomson Whittings drawings have been plotted from diagrams provided by service authorities. This information has been prepared solely for the authorities own use and may not necessarily be updated or accurate.

The position of services as recorded by the authority at the time of installation may not reflect changes in the physical environment subsequent to installation.

Taylor Thomson Whitting does not guarantee that the services information shown on these drawings shows more than the presence or absence of services, and will accept no liability for inaccuracies in the services information shown from any cause whatsoever.

The Contractor must confirm the exact location and extent of services prior to construction and notify any conflict with the drawings immediately to the Engineer/Superintendent.

The contractor is to get approval from the relevant state survey department, to remove/adjust any survey mark. This includes but is not limited to; State Survey Marks (SSM), Permanent Marks (PM), cadastral reference marks or any other survey mark which is to be removed or
adjusted in any way.
Taylor Thomson Whitting plans do not indicate the presence of any survey mark. The contractor is to undertake their own search.

BOUNDARY AND EASEMENT NOTE

The property boundary and easement locations shown on Taylor Thomson Whitting drawing's have been based from information received from : WALPOLE SVY 22072 Rev 4

Taylor Thomson Whitting makes no guarantees that the boundary or easement information shown is correct.
Taylor Thomson Whitting will accept no liabilities for boundary inaccuracies. The contractor/builder is advised to check/confirm all boundaries in relation to all proposed work prior to the commencement of construction. Boundary inaccuracies found are to be reported to the superintendent prior to construction starting.

STORMWATER DRAINAGE NOTES

1 Stormwater Design Criteria :
(A) Average exceedance probability -
1% AEP for roof drainage to first external pit
5% AEP for paved and landscaped areas
(B) Rainfall intensities -
Time of concentration: 12 minutes
1% AEP = 150 mm/hr
5% AEP = 98 mm/hr
(C) Rainfall losses -
Impervious areas: IL = 1.5 mm , CL = 0 mm/hr
Pervious areas: IL = 29mm , CL = 2 mm/hr

2. Pipes 300 dia and larger to be reinforced concrete Class "2" approved spigot and socket with rubber ring joints U.N.O.
5. Precast pits may be used external to the building subject to approval by Council.
6. Enlargers, connections and junctions to be manufactured fittings where pipes are less than 300 dia.
7. Where subsoil drains pass under floor slabs and vehicular pavements, unslotted uPVC sewer grade pipe is to be used.
8. Grates and covers shall conform with AS 3996-2006, and AS 1428.1 for access requirements.
9. Pipes are to be installed in accordance with AS 3725. All bedding to be type H2 U.N.O.
10. Care is to be taken with invert levels of stormwater lines. Grades shown are not to be reduced without approval.
11. All stormwater pipes to be 150 dia at 1.0% min fall U.N.O.
12. Subsoil drains to be slotted flexible uPVC U.N.O.
13. Adopt invert levels for pipe installation (grades shown are only nominal).
14. All drainage works to be installed in accordance with PCC standard details.

SITEWORKS NOTES

1. All basecourse material to comply with RMS specification No 3051 and compacted to minimum 98% modified standard dry density in accordance with AS 1289 5.2.1.
2. All trench backfill material shall be compacted to the same density as the adjacent material.
3. All service trenches under vehicular pavements shall be backfilled with an approved select material and compacted to a minimum 98% standard maximum dry density in accordance with AS 1289 5.1.1

KERBING NOTES

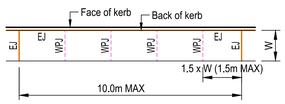
Includes all kerbs, gutters, dish drains, crossings and edges.

1. All kerbs, gutters, dish drains and crossings to be constructed on minimum 75mm granular basecourse compacted to minimum 98% modified maximum dry density in accordance with AS 1289 5.2.1.
2. Expansion joints (EJ) to be formed from 10mm compressible cork filler board for the full depth of the section and cut to profile. Expansion joints to be located at drainage pits, on tangent points of curves and elsewhere at 12m centres except for integral kerbs where the expansion joints are to match the joint locations in slabs.
3. Weakened plane joints to be min 3mm wide and located at 3m centres except for integral kerbs where weakened plane joints are to match the joint locations in slabs.
4. Broomed finished to all ramped and vehicular crossings, all other kerbing or dish drains to be steel float finished.
5. In the replacement of kerbs -
Existing road pavement is to be sawcut 900mm from lip of gutter. Upon completion of new kerbs, new basecourse and surface is to be laid 900mm wide to match existing materials and thicknesses.
Existing allotment drainage pipes are to be built into the new kerb with a 100mm dia hole.
Existing kerbs are to be completely removed where new kerbs are shown.

JOINTING NOTES

Pedestrian Footpath Jointing

1. Expansion joints (EJ) are to be located where possible at tangent points of curves and elsewhere at max 10.0m centres.
2. Weakened plane joints (WPJ) are to be located at a max 1.5 x width of the pavement.
3. Where possible joints should be located to match kerbing and / or adjacent pavement joints.
4. All pedestrian footpath jointings as follows U.N.O.



Wall Jointing

1. For concrete walls, weakened plane joints (WPJ) or control joints (CJ) to be located at a maximum of 8.0m centres. Expansion joints (EJ) to be located at a maximum of 30.0m centres U.N.O.
2. For blockwork walls, dowelled control joints (CJ) to be located at maximum of 8.0m spacing U.N.O.

CONCRETE FINISHING NOTES

1. All exposed concrete pavements are to be broomed finished unless noted otherwise in the Landscape Drawings/Specifications.
2. All edges of the concrete pavement including keyed and dowelled joints are to be finished with an edging tool.
3. Concrete pavements with grades greater than 10 % shall be heavily broomed finished.
4. Carborundum to be added to all stair treads and ramped crossings U.N.O.

BULK EARTHWORKS NOTES

1. Contractor to reference geotechnical report for subgrade preparation requirements
2. All batters at a maximum slope to be confirmed and subject to geotechnical engineer advice.
3. Excavated material may be used as structural fill provided,
(i) it complies with the specification requirements for fill material,
(ii) the placement moisture content complies with the Geotechnical Consultants requirements, and allows filling to be placed and proof-rolled in accordance with the specification. Where necessary the Contractor must moisture condition the excavated material to meet these requirements.
4. Compact fill areas and subgrade to not less than:

Location	Standard dry density (AS 1289 5.1.1.)	Optimum moisture content (OMC)
Under building slabs on ground:	98%	±2%
Under roads and carparks:	98%	±2%
Landscaped areas:	95%	±2%

5. Before placing fill, proof roll exposed subgrade with a 10 tonne minimum roller to test subgrade and then remove soft spots (areas with more than 3mm movement under roller). Soft spots to be replaced with granular fill unless noted otherwise.
6. Contractor shall place safety barriers around excavations in accordance with relevant safety regulations.
7. Bulk earthworks drawings are not to be used for detailed excavation in landscape zones. Contractor to make allowance for additional fill or cut through landscape zones.
8. Contractor to review landscape drawings to confirm softscape profile depths
9. Strip all topsoil from the construction area. All stripped topsoil shall be disposed of off-site unless directed otherwise.
10. Make smooth connection with all existing works
11. Compact subgrade under buildings and pavements to minimum 98% standard maximum dry density in accordance with AS1289.5.1.1. Compaction under buildings to extend 2.0m minimum beyond building footprint
12. Temporary stormwater control and connections to be managed onsite by the builder/contractor
13. Site to be free draining and subgrade to be protected from moisture ingress.
14. Dewatering to be managed by contractor at all times.
15. Quantities to underlying geology such as rock or natural clay are indicative only and based on the geotechnical information available at the time of issue. Underlying natural clay and rock levels can be highly variable between geotech sample locations.
16. All earthworks activities shall be undertaken with level 1 supervision in accordance with AS3798 (2007) by a suitably qualified geotechinical inspection and testing authority (GITA) engaged by the contractor. As a minimum, the frequency and location of testing shall be in accordance with table 8.1 of AS3798 (2007). The GITA is to maintain daily site record sheets as set out in AS3798 (2007)

EROSION AND SEDIMENT CONTROL NOTES

1. All work shall be generally carried out in accordance with
(A) Local authority requirements,
(B) EPA - Pollution control manual for urban stormwater,
(C) LANDCOM NSW - Managing Urban Stormwater: Soils and Construction ("Blue Book").
2. The erosion and sediment control shall be implemented and adapted to meet the varying situations as work on site progresses.
3. Maintain all erosion and sediment control devices to the satisfaction of the superintendent and the local authority.
4. When stormwater pits are constructed prevent site runoff entering the pits unless silt fences are erected around pits.
5. Minimise the area of site being disturbed at any one time.
6. Protect all stockpiles of materials from scour and erosion. Do not stockpile loose material in roadways, near drainage pits or in watercourses.
7. All soil and water control measures are to be put back in place at the end of each working day, and modified to best suit site conditions.
8. Control water from upstream of the site such that it does not enter the disturbed site.
9. All construction vehicles shall enter and exit the site via the temporary construction entry/exit.
10. All vehicles leaving the site shall be cleaned and inspected before leaving.
11. Maintain all stormwater pipes and pits clear of debris and sediment. Inspect stormwater system and clean out after each storm event.
12. Clean out all erosion and sediment control devices after each storm event.

Sequence Of Works

1. Prior to commencement of excavation the following soil management devices must be installed.
1.1. Construct silt fences below the site and across all potential runoff sites.
1.2. Construct temporary construction entry/exit and divert runoff to suitable control systems.
1.3. Construct measures to divert upstream flows into existing stormwater system.
1.4. Construct sedimentation traps/basin including outlet control and overflow.
1.5. Construct turf lined swales.
1.6. Provide sandbag sediment traps upstream of existing pits.
2. Construct geotextile filter pit surround around all proposed pits as they are constructed.
3. On completion of pavement provide sand bag kerb inlet sediment traps around pits.
4. Provide and maintain a strip of turf on both sides of all roads after the construction of kerbs.

WATER QUALITY TESTING REQUIREMENTS

Prior to discharge of site stormwater, groundwater and seepage water
into council's stormwater system, contractors must undertake water quality tests in conjunction with a suitably qualified environment consultant outlining the following:

- Compliance with the criteria of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)
- If required subject to the environmental consultants advice, provide remedial measures to improve the quality of water that is to be discharged into Councils storm water drainage system.This should include comments from a suitably qualified environmental consultant confirming the suitability of these remedial measures to manage the water discharged from the site into Councils storm water drainage system. Outlining the proposed, ongoing monitoring, contingency plans and validation program that will be in place to continually monitor the quality of water discharged from this site. This should outline the frequency of water quality testing that will be undertaken by a suitably qualified environmental consultant.

SAFETY IN DESIGN

Contractor to refer to Appendix B of the Civil Specification for the Civil Risk and Solutions Register.

EXISTING SERVICES

Contractor to be aware existing services are located within the site. Location of all services to be verified by the Contractor prior to commencing works. Contractor to confirm with relevant authority regarding measures to be taken to ensure services are protected or procedures are in place to demolish and/or relocate.

EXISTING STRUCTURES

Contractor to be aware existing structures may exist within the site. To prevent damage to existing structure(s) and/or personnel, site works to be carried out as far as practicably possible from existing structure(s).

EXISTING TREES

Contractor to be aware existing trees exist within the site which need to be protected. To prevent damage to trees and/or personnel, site works to be carried out as far as practicably possible from existing trees. Advice needs to be sought from Arborist and/or Landscape Architect on measures required to protect trees. Refer to report 'ARB_220623_TreeIQ Wentworth Health Service Preliminary Advice' by TreeIQ dated 23/06/22.

GROUNDWATER

Contractor to be aware ground water levels are close to existing surface level. Temporary de-watering may be required during construction works.

EXCAVATIONS

Deep excavations due to stormwater drainage works is required. Contractor to ensure safe working procedures are in place for works. All excavations to be fenced off and batters adequately supported to approval of Geotechnical Engineer.

GROUND CONDITIONS

Contractor to be aware of the site geotechnical conditions. Refer to geotechnical report by JK Geotechnics (16 Nov 2017, ref:30993ZArpt) for details.

HAZARDOUS MATERIALS

Existing asbestos products & contaminated material are present on site. Contractor to ensure all hazardous materials are identified prior to commencing works. Safe working practices as per relevant authority to be adopted and appropriate PPE to be used when handling all hazardous materials. Remediation of ACM exposed on site shall be undertaken in accordance with the requirements noted in the Remediation Action Plan (RAP) by JBS&G. ACM volumes are indicative only and are based on nominal 150mm depth across area noted in the detailed site investigation report by JBS&G.

CONFINED SPACES

Contractor to be aware of potential hazards due to working in confined spaces such as stormwater pits, trenches and/or tanks. Contractor to provide safe working methods and use appropriate PPE when entering confined spaces.

MANUAL HANDLING

Contractor to be aware manual handling may be required during construction. Contractor to take appropriate measures to ensure manual handling procedures and assessments are in place prior to commencing works.

WATER POLLUTION

Contractor to ensure appropriate measures are taken to prevent pollutants from construction works contaminating the surrounding environment.

SITE ACCESS/EGRESS

Contractor to be aware site works occur in close proximity to footpaths and roadways. Contractor to erect appropriate barriers and signage to protect site personnel and public.

VEHICLE MOVEMENT

Contractor to supply and comply with traffic management plan and provide adequate site traffic control including a certified traffic marshall to supervise vehicle movements where necessary.

SITEWORKS LEGEND

- × F22.20 — FINISHED SURFACE LEVEL
- 22.00 — FINISHED MAJOR CONTOUR
- 22.10 — FINISHED MINOR CONTOUR
- PROPERTY BOUNDARY
- K&G — KERB AND GUTTER
- KO — KERB ONLY
- K&G - O — KERB AND GUTTER WITH OPENINGS
- IL 10.20 — STORMWATER PIT AND DRAIN
- GT — GRATED TRENCH
- AG — AG (SUBSOIL) DRAIN
- GI — GRATED INLET / FLOOR WASTE
- CONCRETE ENDWALL
- IO — INSPECTION OPENING WITH SUBSOIL DRAINAGE LINE (100 DIA)
- FP — FLUSHOUT POINT WITH SUBSOIL DRAINAGE LINE (100 DIA)
- DP — DOWN PIPE
- OVERLAND FLOWPATH
- RW — RETAINING WALL
- BATTER
- SAWCUT JOINT
- EXPANSION JOINT
- DOWELLED SAWCUT JOINT
- DOWELLED EXPANSION JOINT
- BIO SWALE
- GRASSED SWALE
- GUARD RAIL
- FENCE
- TPZ — TPZ — TREE PROTECTION ZONE
- SRZ — SRZ — STRUCTURAL ROOT ZONE

EXISTING SERVICES LEGEND

- eT — TELECOM
- eG — GAS
- eE — ELECTRICAL
- eO — ELECTRICAL (OVERHEAD)
- eW — WATER
- eD — STORM WATER
- eS — SEWER

DRAWINGS TO BE PRINTED IN Y M C [R] G B K

WORKS NEAR EXISTING SERVICES
ALL EXISTING UNDERGROUND SERVICES ARE TO BE LOCATED ON SITE PRIOR TO COMMENCING WORKS

WORKS NEAR EXISTING TREES
PRECAUTIONS ARE TO BE UNDERTAKEN TO ENSURE EXISTING TREES IN THE VICINITY OF WORKS ARE NOT DAMAGED DURING CONSTRUCTION ACTIVITIES

CIVIL SPECIFICATIONS
DRAWINGS TO BE READ IN CONJUNCTION WITH THE CIVIL SPECIFICATION. REFER APPENDIX A FOR INSPECTION HOLD POINTS

HIGH VOLTAGE ELECTRICAL CABLE
PRECAUTIONS ARE TO BE UNDERTAKEN TO ENSURE HIGH VOLTAGE CABLE IN THE VICINITY OF WORKS IS NOT DAMAGED DURING CONSTRUCTION ACTIVITIES.
LIAISE WITH ASSET OWNER AS REQUIRED

EXISTING STORMWATER ASSETS
SIZE, INVERT LEVEL AND CONDITION OF ALL AFFECTED EXISTING STORMWATER ASSETS TO BE CONFIRMED PRIOR TO COMMENCING WORKS

Rev	Description	Eng	Draft	Date
2	REF ISSUE	RP	AE	11.04.23
1	ISSUED FOR SD	RP	AE	23.11.22

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BEWARE OF UNDERGROUND SERVICES.
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Project
WENTWORTH HEALTH SERVICE REDEVELOPMENT
24 HOSPITAL ROAD, WENTWORTH, NSW, 2648

Drawing Title
NOTES AND LEGENDS SHEET

Architect
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+61 2 9922 2344 nbrs.com.au
Nominated Architect:
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Scale: A1 Drawn: AE Authorised: RP

Job No 221039 Drawing No C002 Revision 2

Plot File Created: Apr 11, 2023 - 6:33pm

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C002

EROSION AND SEDIMENT CONTROL LEGEND

- SILTATION FENCE
- STORMWATER PIT WITH GEOTEXTILE FILTER SURROUND
- HAY BALE BARRIERS
- SANDBAG SEDIMENT TRAP
- CATCH DRAIN / OPEN CHANNEL
- STAGE 1A - LIMIT OF WORKS BOUNDARY (INDICATIVE)
- STAGE 1B - LIMIT OF WORKS BOUNDARY (INDICATIVE)
- STAGE 2 - LIMIT OF WORKS BOUNDARY (INDICATIVE)
- TREE PROTECTION ZONE
- STRUCTURAL ROOT ZONE

DARLING RIVER

HEAVY VEGETATION

EXISTING HOSPITAL BUILDING

TEMPORARY SILT FENCE AROUND EXTENT OF WORKS LOCATION IS SHOWN INDICATIVELY ONLY AND IS TO BE CONFIRMED BY CONTRACTOR

PROPOSED TEMPORARY OPEN CHANNEL LOCATION (STAGE 1A). CONTRACTOR TO PROVIDE/CONFIRM ONSITE

DISCHARGE FROM SITE TO BE PROVIDED AND CONTROLLED BY CONTRACTOR (TYP.)

PROVIDE GEOTEXTILE FILTER PIT SURROUND AND SANDBAG SEDIMENT TRAP TO EXISTING GRATED PIT

CONTRACTOR TO MONITOR SITE RUNOFF DURING CONSTRUCTION TO ENSURE SEDIMENT LADEN WATER IS NOT DISCHARGED FROM THE SITE TO DARLING RIVER

TEMPORARY SEDIMENT BASIN TO TREAT SITE RUNOFF. SHOWN INDICATIVELY ONLY

PROPOSED TEMPORARY OPEN CHANNEL LOCATION (STAGE 1A). CONTRACTOR TO PROVIDE/CONFIRM ONSITE

HAYBALE SEDIMENT FILTER ALONG OPEN CHANNEL (TYP.). SHOWN INDICATIVELY ONLY

PROPOSED TEMPORARY OPEN CHANNEL LOCATION (STAGE 1B). CONTRACTOR TO PROVIDE/CONFIRM ONSITE

PROVIDE GEOTEXTILE FILTER PIT SURROUND AND SANDBAG SEDIMENT TRAP TO TEMPORARY GRATED PIT

DISCHARGE FROM SITE TO BE PROVIDED AND CONTROLLED BY CONTRACTOR (TYP.)

TREE 67 TO BE PROTECTED IN ACCORDANCE WITH ARBORIST REQUIREMENTS. PROPOSED LEVELS WITHIN TPZ ABOVE EXISTING GRADE

PROVIDE GEOTEXTILE FILTER PIT SURROUND AND SANDBAG SEDIMENT TRAP TO TEMPORARY GRATED PIT

DISCHARGE FROM SITE TO BE PROVIDED AND CONTROLLED BY CONTRACTOR (TYP.)

TEMPORARY SILT FENCE LOCATION IS SHOWN INDICATIVELY ONLY AND IS TO BE CONFIRMED BY CONTRACTOR

EXISTING BUILDING

TEMPORARY SILT FENCE LOCATION IS SHOWN INDICATIVELY ONLY AND IS TO BE CONFIRMED BY CONTRACTOR

DISCHARGE FROM SITE TO BE PROVIDED AND CONTROLLED BY CONTRACTOR (TYP.)

EXISTING BUILDING

WORKS WITHIN TREE PROTECTION ZONES SHALL BE UNDERTAKEN IN ACCORDANCE WITH ARBORIST REQUIREMENTS

REMEDIATION OF ASBESTOS CONTAMINATED MATERIALS 'ACM' EXPOSED ON SITE SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE REQUIREMENTS NOTED IN THE REMEDIATION ACTION PLAN (RAP) BY JBS&G. THE CONTRACTOR SHALL ALSO REFER TO THE THE DETAILED SITE INVESTIGATION REPORT BY JBS&G

EARTHWORKS AND TEMPORARY BATTERS TO BE CONSTRUCTED IN ACCORDANCE WITH GEOTECHNICAL REPORT TO ENSURE BATTER STABILITY IN THE INTERIM CONDITION.

CONSIDERATION TO BE MADE TO PROVIDING RESIN BINDER POLYMER SPRAY TO ALL INTERIM BATTERS AT INTERFACE OF THE WORKS. DIRTGLUE OR EQUIVALENT.

THE CONTRACTOR SHALL ENSURE THAT DUST SUPPRESSION MEASURES ARE IMPLEMENTED DURING AND UPON COMPLETION OF WORKS ACROSS THE EXTENT OF WORKS. OPTIONS INCLUDE, BUT ARE NOT LIMITED TO:

- HYDROSEEDING (PROVIDE 50mm TOP SOIL LAYER - NOT INCLUDED IN FILL VOLUME ESTIMATES)
- RESIN POLYMER BINDER SPRAY

THE CONTRACTOR SHALL SEEK APPROVAL FROM THE SUPERINTENDENT FOR PROPOSED ALTERNATIVE MEASURES

SCALE 1:300 0 2.5 5 7.5 10 12.5 m
AT ORIGINAL SIZE

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date
1	REF ISSUE	RP	AE	11.04.23

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BEWARE OF UNDERGROUND SERVICES.
THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN

Project
WENTWORTH HEALTH SERVICE REDEVELOPMENT
24 HOSPITAL ROAD, WENTWORTH, NSW, 2648

Drawing Title
EROSION AND SEDIMENT CONTROL PLAN

Architect
NBRS
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Nominated Architect:
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Scale: A1 Drawn: AE Authorised: RP

Job No	Drawing No	Revision
221039	C100	1

Plot File Created: Apr 11, 2023 - 6:34pm

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C002

SITEWORKS LEGEND

- × F22.20 — FINISHED SURFACE LEVEL
- 22.00 — FINISHED MAJOR CONTOUR
- 22.10 — FINISHED MINOR CONTOUR
- PROPERTY BOUNDARY
- K&G — KERB AND GUTTER
- KO — KERB ONLY
- FK — FLUSH KERB
- IL 10.20 — STORMWATER PIT AND DRAIN
- GT — GRATED TRENCH
- AG — AG (SUBSOIL) DRAIN
- GI — GRATED INLET / FLOOR WASTE
- CONCRETE ENDWALL
- IO — INSPECTION OPENING WITH SUBSOIL DRAINAGE LINE (100 DIA)
- FP — FLUSHOUT POINT WITH SUBSOIL DRAINAGE LINE (100 DIA)
- DP — DOWN PIPE
- OVERLAND FLOWPATH
- RW — RETAINING WALL
- BATTER
- BIO SWALE
- GRASSED SWALE
- TPZ — TREE PROTECTION ZONE
- SRZ — STRUCTURAL ROOT ZONE
- PROPOSED ACM CAP AND CONTAIN LOCATION

DARLING RIVER

EXISTING LEVEE BANK

NEW HOSPITAL BUILDING
FFL 36.00

EXISTING CARPARK

LANDSCAPE BATTER REFER TO LANDSCAPE DRAWINGS FOR DETAILS

STAGE 1B & 2 ACM MATERIAL (APPROX. 400 m³) CAPPED AND CONTAINED WITHIN LANDSCAPE BATTER. SHOWN INDICATIVELY ONLY

LANDSCAPE MOUND REFER TO LANDSCAPE DRAWINGS FOR DETAILS

STAGE 1A ACM MATERIAL (APPROX. 740 m³) CAPPED AND CONTAINED WITHIN LANDSCAPE MOUND. SHOWN INDICATIVELY ONLY

MATCH LEVELS TO TOP OF LEVEE BANK

MATCH INTO EXISTING PAVEMENT LEVELS AND MAKE GOOD AT INTERFACE

MATCH INTO EXISTING KERB AND MAKE GOOD

1:40 LANDING

3m WIDE GRASSED SWALE MIN 1 IN 200 SLOPE TO GRATED SW PIT

1.5m WIDE BIO-SWALE

ABOVEGROUND RWHT. CONNECT 225Ø OVERFLOW TO SW PIT

TEMPORARY 1.5m MAX HEIGHT BLOCKWORK RETAINING WALL ALONG INTERFACE WITH EXISTING HOSPITAL (STAGE 1A)

18 m² BIO-RETENTION RAINGARDEN

TREE 67 TO BE PROTECTED IN ACCORDANCE WITH ARBORIST REQUIREMENTS. PROPOSED LEVELS WITHIN TPZ ABOVE EXISTING GRADE

SERVICES ROOMS - FFL 34.70

CONNECT FIRE TANK OVERFLOWS TO GRATED SW PIT. SERVICES PLINTHS SET ABOVE RL 34.65

CONNECT ROOF DOWNPIPES FOR NEW BUILDINGS TO INGROUND SW DRAINAGE. DETAIL TBC

EXISTING Ø300 RCP OUTLET

INSTALL NON-RETURN VALVES TO PREVENT BACKFLOW. PERMISSIBLE SITE DISCHARGE 124 l/s (Ex. Ø300 PIPE CAPACITY)

SPEL ECOCEPTOR 1500 SERIES - E.240/153030.RCP OR APPROVED EQUIVALENT

BAFFLE PIT WITH ORIFICE PLATE TO RESTRICT FLOWS TO 48 l/s

15KL UNDERGROUND ON-SITE DETENTION (OSD) 5.4 X 3.6m SD ACO STORMBRIXX OR APPROVED EQUIVALENT.

STORE ROOM AND MAINTENANCE SHED - FFL 35.67

TAPER KERBS TO ZERO HEIGHT OVER 1m

SPEL ECOCEPTOR 1500 - E240/153030.RCP SERIES OR APPROVED EQUIVALENT

BAFFLE PIT WITH ORIFICE PLATE TO RESTRICT FLOWS TO 73 l/s

GENERATOR SLAB - SSL 34.90

25KL UNDERGROUND ON-SITE DETENTION (OSD). 9.6 X 3.0m HD ACO STORMBRIXX OR APPROVED EQUIVALENT.

CARPARK EXTENDED DETENTION DEPTH OSD STORAGE 1 IN 100 YR RL 34.65 (BLUE DASH LINE)

SCALE 1:300 0 2.5 5 7.5 10 12.5 m
AT ORIGINAL SIZE

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date
3	REF ISSUE	RP	AE	11.04.23
2	ISSUED FOR SD	RP	AE	23.11.22
1	ISSUED FOR DRAFT SD	RP	AE	21.11.22

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BEWARE OF UNDERGROUND SERVICES. THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN

Project
WENTWORTH HEALTH SERVICE REDEVELOPMENT
24 HOSPITAL ROAD, WENTWORTH, NSW, 2648

Drawing Title
SITE PLAN

Architect
NBRS
+61 2 9922 2344 nbrs.com.au
Nominated Architect: Andrew Duffin NSW 5602
NBRS & Partners Pty Ltd VIC 51197 ABN 16 002 247 565

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Scale: A1 Drawn: AE Authorised: RP

Job No	Drawing No	Revision
221039	C210	3

Plot File Created: Apr 11, 2023 - 6:47pm

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C002

PAVEMENT LEGEND

P1 — ASPHALT VEHICULAR PAVEMENT
40mm thickness asphalt (AC14) with primerseal on 170mm compacted thickness DGB20 or equivalent on 250mm select fill material (Ev=150Mpa) on evenly compacted sub-grade to 100% standard maximum dry density in accordance with A.S.1289.5.1.1 (Min. CBR 3.0%)

P2 — CONCRETE PEDESTRIAN PAVEMENT
125mm thickness concrete (f'c = 32MPa) with SL62 fabric mesh (40 cover) on 100mm compacted thickness DGB20 on evenly compacted sub-grade to 100% standard maximum dry density in accordance with A.S.1289.5.1.1 (Min. CBR 3.0%)

P3 — GRAVEL/PERMEABLE PAVEMENT
Refer to Landscape Specifications for details

ANY UNCONTROLLED/SOFT SPOT TO BE REMOVED AND BACKFILL WITH ENGINEERING FILL/PROOF ROLL AND COMPACTED IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATION

REFER TO GEOTECHNICAL REPORT FOR SUBGRADE PREPARATION REQUIREMENTS

TREE 67 TO BE PROTECTED IN ACCORDANCE WITH ARBORIST REQUIREMENTS. PROPOSED LEVELS WITHIN TPZ ABOVE EXISTING GRADE

SCALE 1:300 0 2.5 5 7.5 10 12.5
AT ORIGINAL SIZE m

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date
3	REF ISSUE	RP	AE	11.04.23
2	ISSUED FOR SD	RP	AE	23.11.22
1	ISSUED FOR DRAFT SD	RP	AE	21.11.22

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Project
WENTWORTH HEALTH SERVICE REDEVELOPMENT
24 HOSPITAL ROAD, WENTWORTH, NSW, 2648

Drawing Title
PAVEMENT AND JOINTING PLAN

Architect
NBRS
+61 2 9922 2344 nbrs.com.au
Nominated Architect:
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Civil Engineer
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Scale: A1 Drawn: AE Authorised: RP

Job No	Drawing No	Revision
221039	C310	3

Plot File Created: Apr 11, 2023 - 6:48pm

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C002

LEVELS TABLE

No.	FROM LEVEL (m)	TO LEVEL (m)	COLOUR
1	-0.70	-0.10	
2	-0.10	0.50	
3	0.50	1.10	
4	1.10	1.70	
5	1.70	2.30	

× FX.XX DENOTES CUT / FILL DEPTH FROM NATURAL SURFACE TO DESIGN SURFACE

CUT AND FILL ESTIMATES

	STAGE 1A	STAGE 1B	STAGE 2
AREA OF WORKS	6,620 m²	3,790 m²	1,050 m²
CUT (UNCONTROLLED FILL)	2,130 m³	1,000 m³	210 m³
ACM (APPROX 150mm DEPTH OF TOPSOIL/FILL)	740 m³	230 m³	170 m³
FILL (TO BENCHING LEVEL)	8,310 m³	2,350 m³	120 m³

1. NO BULKING FACTOR APPLIED.
2. CUT AND FILL VOLUME ESTIMATES CALCULATED FROM THE FINISHED EARLY WORKS STRIPPED SURFACE (150mm BELOW NATURAL SURFACE) TO THE DESIGN BULK EARTHWORKS BENCHING SURFACE.
3. FOR RE-USE OF SITE WON MATERIAL, REFERENCE SHOULD BE MADE TO THE GEOTECHNICAL REPORT. THE CONTRACTOR IS TO MAKE ALLOWANCE FOR SORTING/TESTING AND HANDLING OF ANY FILL MATERIAL PROPOSED FOR RE-USE. ALL TESTING SHALL BE AT THE CONTRACTOR'S EXPENSE.
4. NO VOLUME ALLOWANCE OF BENCHING FOR STRUCTURAL FOOTINGS, SERVICE TRENCHES AND INGROUND SERVICES TANKS.

NEW HOSPITAL BUILDING

SCALE 1:300 0 2.5 5 7.5 10 12.5 m
AT ORIGINAL SIZE

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Rev	Description	Eng	Draft	Date
4	REF ISSUE	RP	AE	11.04.23
3	PRELIMINARY	RP	AE	19.12.22
2	ISSUED FOR SD	RP	AE	23.11.22
1	ISSUED FOR DRAFT SD	RP	AE	21.11.22

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Project
WENTWORTH HEALTH SERVICE REDEVELOPMENT
24 HOSPITAL ROAD, WENTWORTH, NSW, 2648

Drawing Title
CUT & FILL PLAN

Architect
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Nominated Architect:
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Scale: A1 Drawn: AE Authorised: RP

Job No	Drawing No	Revision
221039	C410	4

Plot File Created: Apr 11, 2023 - 6:32pm

Appendix C Wentworth Health Service Redevelopment – Landscape Plans

(Prepared by NBRS)

SHEET LIST - REF DRAWINGS	
Sheet Number	Sheet Name
REF-1000	COVER SHEET
REF-1001	LEGEND
REF-1201	GENERAL ARRANGEMENT PLAN - MILESTONE 1A
REF-1202	GENERAL ARRANGEMENT PLAN - MILESTONE 1B
REF-1203	GENERAL ARRANGEMENT PLAN - STAGE 2
REF-1601	PLANTING PLAN - MILESTONE 1A
REF-1602	PLANTING PLAN - MILESTONE 1B
REF-1603	PLANTING PLAN - STAGE 2
REF-1701	TREE PLANTING PLAN - MILESTONE 1A & 1B
REF-1801	TREE REMOVAL PLAN
REF-1802	TREE RETENTION PLAN

NBRS

REF

PROJECT MANAGER
MOSTYN COPPER

ELECTRICAL ENGINEER
STEENSEN VARMING

CIVIL ENGINEER
TTW

HYDRAULIC ENGINEER
WSP

TRAFFIC CONSULTANT
SCT CONSULTING

COST MANAGER
GENUS ADVISORY

Issue

No.	Date	Description	Chkd
1	11/04/2023	REF ISSUE	JK
2	14/04/2023	REF ISSUE	JK

Changes to this Revision

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Nominated Architect:
Andrew Duffin NSW 5602
NBRS & Partners Pty Ltd VIC 51197 ABN 16 002 247 565

Project
WENTWORTH MSP

at
24 Hospital Rd
Wentworth NSW 2648
for
Health Infrastructure

Drawing Title
COVER SHEET

Date 17/04/2023 10:41:51 AM
Scale 1 : 500 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1000

Revision
2

0 10 20 30 40 50 60 70 80 90 100

SYMBOL	ITEM CODE	MATERIAL DESCRIPTION	TYPE/RANGE/SIZE/COLOUR/FINISH/	LOCATION	INSTALLATION	SUPPLIER
	SURFACE TREATMENT					
PAV01a	PAV01a	CONCRETE	COLOUR: GREY / FINISH: BROOM	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	BUILDER INSITU OR EQUIVALENT
PAV01b	PAV01B	CONCRETE	COLOUR: CSS DESERT SAND / FINISH: BROOM	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	BUILDER INSITU OR EQUIVALENT
PV02a	PAV02a	SEMCO STAIN	COLOUR TBC BY ARTS STRATERGY GROUP	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	SEAMLESS IMPORTS OR EQUIVALENT
PV02b	PAV02b	SEMCO STAIN	COLOUR TBC BY ARTS STRATERGY GROUP	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	SEAMLESS IMPORTS OR EQUIVALENT
PAV03	PAV03	NO-FINES CONCRETE	CSS BUTTERSCOTCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	FWG CONCRETE OR EQUIVALENT
PAV04	PAV04	DECOMPOSED GRAVEL PATH WITH BINDING AGENT	YELLOW STONE / SIZE: 20mm	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	KELSO SANDS MILDURA OR EQUIVALENT
PAV05	PAV05	LOOSE GRAVEL TYPE 01	OVEN KIOWA SIZE: 10mm	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	MILDURA GARDEN SUPPLIES OR EQUIVALENT
PAV06	PAV06	LOOSE GRAVEL TYPE 02	YELLOW STONE / SIZE: 20mm	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	THE ROCKS LANDSCAPE SUPPLIES MILDURA OR EQUIVALENT
PAV07	PAV07	AUSTRAL BRICK PAVERS SCULPTURED SANDS	SCULPTURED SANDS	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	AUSTRAL OR EQUIVALENT
PAV08	PAV08	ORGANIC MULCH	BULK BUDGET MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	MILDURA GARDEN SUPPLIES OR EQUIVALENT
	WALLS, EDGES & BARRIERS					
	WL01	RETAINING WALL	CONCRETE BLOCKS WITH CAPPING COLOUR: STANDARD GREY	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO CIVIL DETAIL	BUILDER INSITU
	WL02	1.2M HIGH POOL FENCE		REFER TO DRAWIIGS	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	ELMSLITE OR EQUIVALENT
	ED01	FORBOSS STEEL EDGE	REDCOR/ SIZE: 1.6 x 75mm-85mm	REFER TO DRAWINGS. REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	VALLEY BOBCAT LANDSCAPING OR EQUIVALENT
	FURNITURE AND FIXTURES					
	FX01	BOULDERS	MOSS ROCKS / CANONS	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	THE ROCKS LANDSCAPE SUPPLIES MILDURA OR EQUIVALENT
	FX02	SEATING BOULDERS	YELLOW ROCK	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	THE ROCKS LANDSCAPE SUPPLIES MILDURA OR EQUIVALENT
	FX03	STEEL INTERP SIGNS	200mm min LASER ETCEHD. SIGNAGE TBC BY ARTS STRATERGY GROUP	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	SIGN GALLERY OR EQUIVALENT
	FX04	FLAG POLES	6m - WHITE POWDER COAT	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	ADDA FLAGPOLES OR EQUIVALENT
	FX 05	SFA LINEA CURVED SEAT	COLOUR: DOE SKIN SIZE: 745W x 790H x 1930 CL (mm)	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	STREET FURNITURE AUSTRALIA OR EQUIVALENT
	FX06	SFA FORUMN SET (TABLE, CHAIRS AND BENCH)	COLOUR: TEXTURA RUSSET	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	STREET FURNITURE AUSTRALIA OR EQUIVALENT
	FX08	FIRE PIT	CORTEN DISH WITH ROLLED LIP / SIZE: 1100mm DIAM x 150mm H	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	LUMP SCULPTURE STUDIO OR EQUIVALENT
	HR01	RAMP HANDRAIL	INCLUDE KICK RAIL	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	SUPPLIER TO BE NOMINATED BY THE CONTRACTOR PRIOR TO ORDERING & CONSTRUCTION
	HR02	RAMP HANDRAIL	STAINLESS STEEL	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	SUPPLIER TO BE NOMINATED BY THE CONTRACTOR PRIOR TO ORDERING & CONSTRUCTION
	HR03	STEP HANDRAIL	STAINLESS STEEL	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	SUPPLIER TO BE NOMINATED BY THE CONTRACTOR PRIOR TO ORDERING & CONSTRUCTION
	PLANTING					
PL01	PL01	Cultural Use Planting Mix	Note: GRAVEL MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL02	PL02	Feature Planting	Note: GRAVEL MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL03	PL03	Endemic Buffer Planting	Note: ORGANIC MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL04	PL04	Bio Swale Planting Mix	Note: ORGANIC MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL05	PL05	Make Good to Existing Condition	Note: RACKED	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL06	PL06	Hydromulch (Seed)	Note: ORGANIC MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO MANUFACTURER'S SPECIFICATION	
PL07	PL07	Large Shrubs Mix	Note: ORGANIC MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL08	PL08	Entry Planting Mix	Note: ORGANIC MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL09	PL09	Rose Garden Relocated	Note: ORGANIC MULCH	REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
PL10	PL10	Staff Lawn Area		REFER TO DRAWINGS.	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
	EX. TREE			REFER TO PLANS		
	PROPOSED TREE			REFER TO PLANS	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	
	DEAD TREE	Cut and retain on site and re-use as habitat/refuge	SAW CUT	REFER TO PLANS	INSTALL WHERE SHOWN ON DRAWING. INSTALL TO LANDSCAPE ARCHITECT DETAIL	

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No.	Date	Description	Chkd
1	11/04/2023	REF ISSUE	JK
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Project
WENTWORTH MSP

at
24 Hospital Rd
Wentworth NSW 2648
for
Health Infrastructure

Drawing Title
LEGEND

Date 17/04/2023 10:42:03 AM
Scale 1 : 100 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1001

Revision
2

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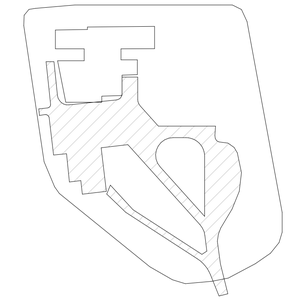
KEY PLAN



REF

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WENTWORTH MSP

at
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Health Infrastructure

Drawing Title
GENERAL ARRANGEMENT PLAN - MILESTONE 1A

Date 17/04/2023 10:42:16 AM
Scale 1 : 500 @ A1

Drawing Reference 21325-NBRS-LS-DD-REF-1201
Revision 2

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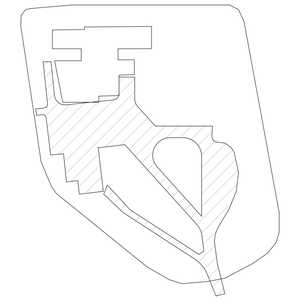
NBRS

KEY PLAN



REF

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WENTWORTH MSP

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Drawing Title
GENERAL ARRANGEMENT PLAN - MILESTONE 1B

Date 17/04/2023 10:42:42 AM
Scale 1 : 500 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1202

Revision
2

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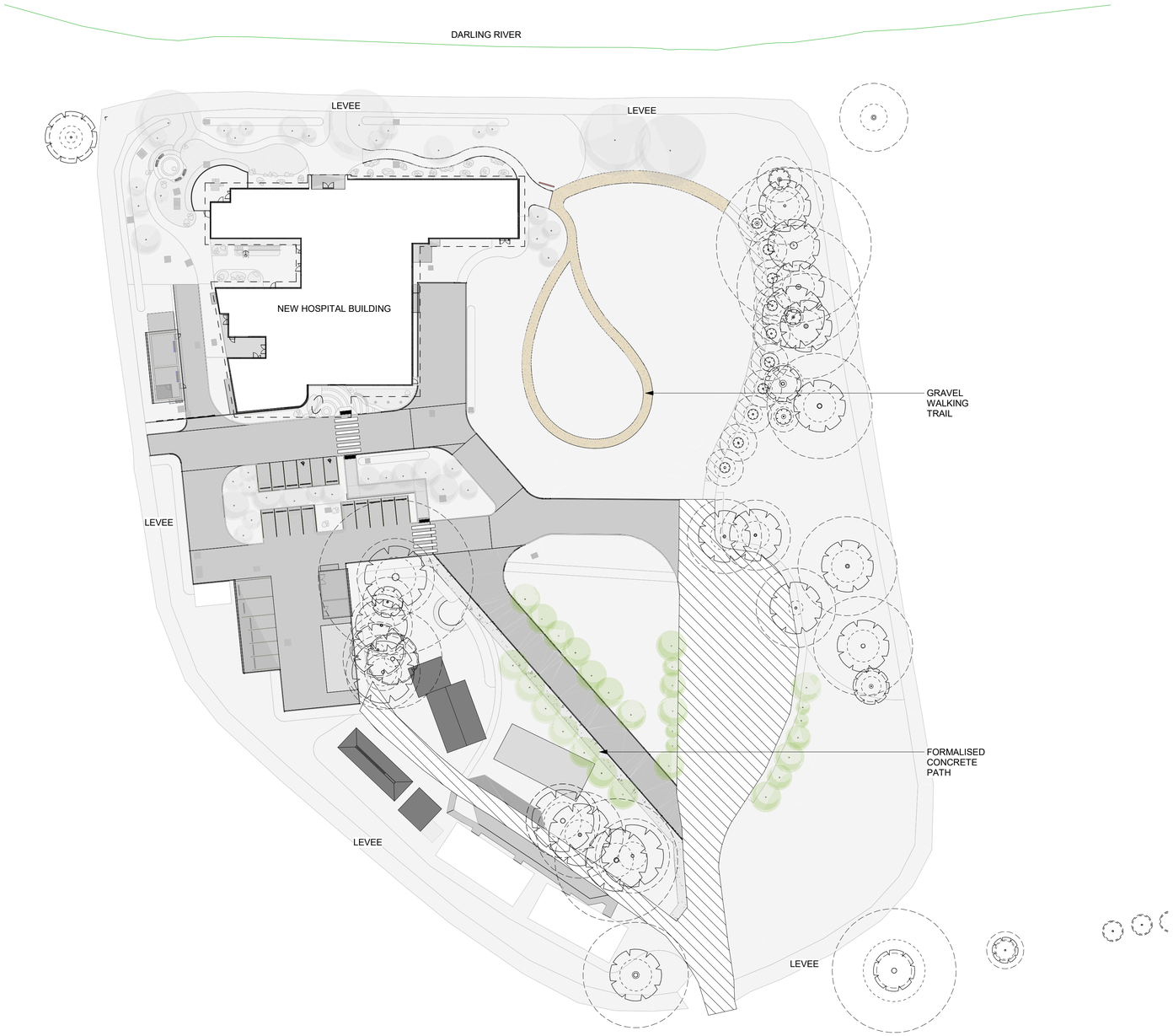

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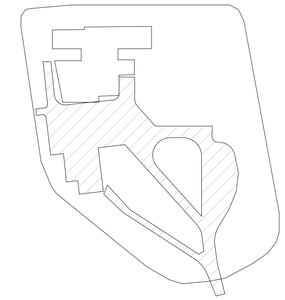

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Drawing Title
GENERAL ARRANGEMENT PLAN - STAGE 2

Date 17/04/2023 10:43:24 AM
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Drawing Reference
21325-NBRS-LS-DD-REF-1203

Revision
2

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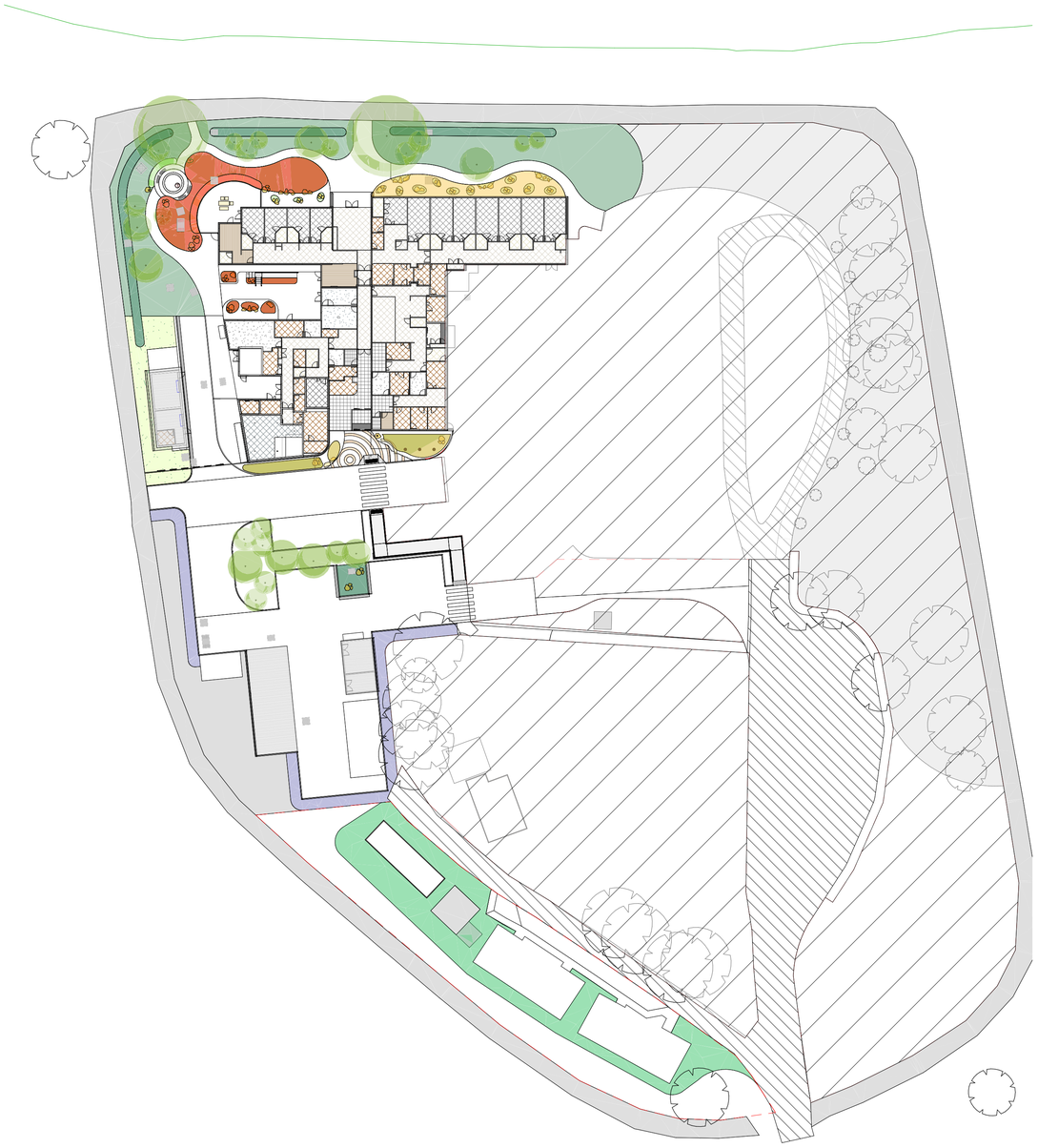

PLANTING SCHEDULE [TREES]

ID	Latin Name	Common Name	Mature Height	Mature Spread	Pot Size	Quantity
STAGE 1A TREES						
ACAste	Acacia stenophylla	River Cooba, Maapu	1-2m	2-4m	45L	2
ACAste(b)	Acacia stenophylla(b)	River Cooba, Maapu	1-2m	2-4m	25L	1
BRApop	Brachychiton populneus	Kurrajong	6-20m	3-6m	45L	1
BRApop(b)	Brachychiton populneus(b)	Kurrajong	6-20m	3-6m	25L	1
CAPmit(b)	Capparis mitchellii(b)	Orange Bumbil, Wild Pomegranate	6-20m	3-6m	25L	2
CORsce	Corymbia citriodora scentuous	Dwarf Lemon Scented Gum	3-7m	3m	45L	6
EUCcam	Eucalyptus camaldulensis	River Red Gum	up to 30m	15m	45L	2
GEIpar	Geijera parviflora	Wilga	6-9m	4-6m	45L	1
MELbra	Melaleuca bracteata	Black Tea Tree	4-7m	3-5m	45L	1
MELhal(b)	Melaleuca halmaturorum(b)	Salt Paperbark	2-6m	2-6m	25L	2
PITang	Pittosporum angustifolium	Weeping Pittosporum, Native Apricot	6-10m	3-5m	45L	1
PITang(b)	Pittosporum angustifolium	Weeping Pittosporum, Native Apricot	6-10m	3-5m	25L	1
SANacu	Santalum acuminatum	Sweet Quandong	4-6m	2-4m	45L	3
SANacu(b)	Santalum acuminatum(b)	Sweet Quandong	4-6m	2-4m	25L	3
					TOTAL	27
					GRAND TOTAL	**27**

PLANTING SCHEDULE

ID	Latin Name	Common Name	Mature Height	Mature Spread	Pot Size	Quantity
CULTURAL USE PLANTING						
ATRnum	Atriplex nummularia	Old Man Saltbush	2-3m		Tubestock	8
CALpur	Calostemma purpureum	Wilcannia Lily	0.6m	0.3m	Tubestock	258
CHRapi	Chrysocephalum apiculatum	Common Everlasting	0.1-0.4m	0.4m-2m	Tubestock	155
DAMros	Dampiera rosmarinifolia	Rosemary Dampiera	0.5-0.6m	1-1.5m	Tubestock	38
DIArev	Dianella revoluta	Blueberry Lily	0.75 - 0.9m	0.3 - 0.6m	Tubestock	104
DISCra	Disphyma crassifolium	Round Lead Pigface	0.2-0.3m	1-2m	Tubestock	37
DODang	Dodonaea viscosa subsp. angustissima	Narrow Leaf Hop Bush	2-4m	2-4m	Tubestock	13
EREmac	Eremophila maculata	Emu Bush	1-3m	1.5-2m	Tubestock	8
PORole	Portulaca oleracea	Common Pigweed	0.1-0.4m	0.4m	Tubestock	179
SARpra	Sarcozona praecox	Pigface	0.1-0.5m	1m	Tubestock	20
TRIsca	Triodia scariosa	Porcupine Grass	0.6-1m	0.5-3m	Tubestock	24
					TOTAL	844
FEATURE PLANTING						
BEYopa	Beyeria opaca	Dark Turpentine Bush	1m	1-2m	Tubestock	4
EREcra	Eremophila crassifolia	Thick Leaf Emu Bush	0.2-1m	1m	Tubestock	16
EREgla	Eremophila glabra	Tar Bush	0.1-0.3m	1-2m	Tubestock	11
KUNpom	Kunzea pomifera	Muntries	0.3-0.5m	2-5m	Tubestock	9
LEPlep	Lepidium leptopetalum	Shrubby Peppercress	0.6m	0.6m	Tubestock	28
MYOpar	Myoporum parvifolium	Creeping Myoporum	0.3m	2-3m	Tubestock	6
SARpra	Sarcozona praecox	Pigface	0.1-0.5m	1m	Tubestock	18
SWAfor	Swainsona formosa	Sturt's Desert Pea	0.5-1m	0.5-1m	Tubestock	22
					TOTAL	114
					TOTAL	**958**

PLANTING MIXES:

COLOUR	CODE	DESCRIPTION	*TOTAL SQM*	PLANT / SQM	POT SIZE	TOTAL NO.
	PLANTING					
	PL03	**Endemic Buffer planting**	*754*	4per m^2	Tubestock	3015
	PL04	**Bio swale planting mix**	*27*	4per m^2	Tubestock	107
	PL06	**Hydromulch**	*416*	SEED MIX	Hydromulch	*416*
	PL08	**Entry planting mix**	*183*	4per m^2	Tubestock	734
					GRANDTOTAL	4272

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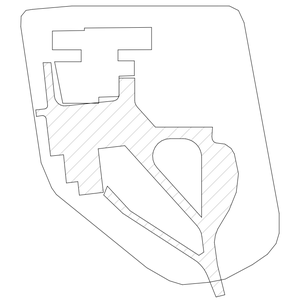
KEY PLAN



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Project
WENTWORTH MSP

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Health Infrastructure

Drawing Title
PLANTING PLAN - MILESTONE 1A

Date 17/04/2023 10:43:48 AM
Scale 1 : 500 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1601

Revision
2

0 10 20 30 40 50 60 70 80 90 100

PLANTING SCHEDULE [TREES]						
ID	**Latin Name**	**Common Name**	**Mature Height**	**Mature Spread**	**Pot Size**	**Quantity**
STAGE 1B TREES						
ACAste	Acacia stenophylla	River Cooba, Maapu	1-2m	2-4m	45L	2
ACAste(b)	Acacia stenophylla(b)	River Cooba, Maapu	1-2m	2-4m	25L	2
EUCcam	Eucalyptus camaldulensis	River Red Gum	up to 30m	15m	45L	2
GElpar(b)	Geijera parviflora(b)	Wilga	6-9m	4-6m	25L	2
MELbra(b)	Melaleuca bracteata(b)	Black Tea Tree	4-7m	3-5m	25L	1
PITang	Pittosporum angustifolium	Weeping Pittosporum, Native Apricot	6-10m	3-5m	45L	1
PITang(b)	Pittosporum angustifolium	Weeping Pittosporum, Native Apricot	6-10m	3-5m	25L	1
SANacu	Santalum acuminatum	Sweet Quandong	4-6m	2-4m	45L	1
SANmur(b)	Santalum murrayanum(b)	Bitter Quandong	1-4m	2-3m	25L	1
					TOTAL	13

PLANTING MIXES:

COLOUR	CODE	DESCRIPTION	*TOTAL SQM*	PLANT / SQM	POT SIZE	TOTAL NO.
	PLANTING					
	PL06	**Hydromulch**	*6575*	SEED MIX	Hydromulch	6575
	PL07	**Large Shrubs mix**	*60*	4per m^2	Tubestock	237
	PL08	**Entry planting mix**	*171*	4per m^2	Tubestock	682
	PL09	**Rose Garden Relocated**	*12*	4per m^2	Tubestock	45
	PL10	**Staff lawn area**	*463*	Turf	Rolled Turf	463
					GRANDTOTAL	8002

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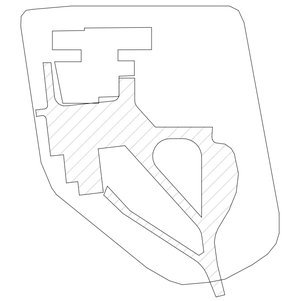
KEY PLAN



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WENTWORTH MSP

at
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Wentworth NSW 2648
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Health Infrastructure

Drawing Title
PLANTING PLAN - MILESTONE 1B

Date 17/04/2023 10:44:15 AM
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Drawing Reference
21325-NBRS-LS-DD-REF-1602

Revision
2

0 10 20 30 40 50 60 70 80 90 100

PLANTING SCHEDULE [TREES]						
ID	**Latin Name**	**Common Name**	**Mature Height**	**Mature Spread**	**Pot Size**	**Quantity**
STAGE 2 TREES						
CAPmit(b)	Capparis mitchellii(b)	Orange Bumbil, Wild Pomegranate	6-20m	3-6m	25L	2
GElpar(b)	Geijera parviflora(b)	Wilga	6-9m	4-6m	25L	2
MELbra(b)	Melaleuca bracteata(b)	Black Tea Tree	4-7m	3-5m	25L	2
MELhal(b)	Melaleuca halmaturorum(b)	Salt Paperbark	2-6m	2-6m	25L	2
SANmur(b)	Santalum murrayanum(b)	Bitter Quandong	1-4m	2-3m	25L	4
EUCstckl	Eucalyptus stricklandii	Stricklands Gum	10-15m	7-9m	25L	16
					TOTAL	28

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WENTWORTH HSR

at
24 Hospital Rd
Wentworth NSW 2648
for
Health Infrastructure

Drawing Title
PLANTING PLAN - STAGE 2

Date 1/05/2023 2:18:08 PM
Scale 1 : 500 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1603

Revision
3

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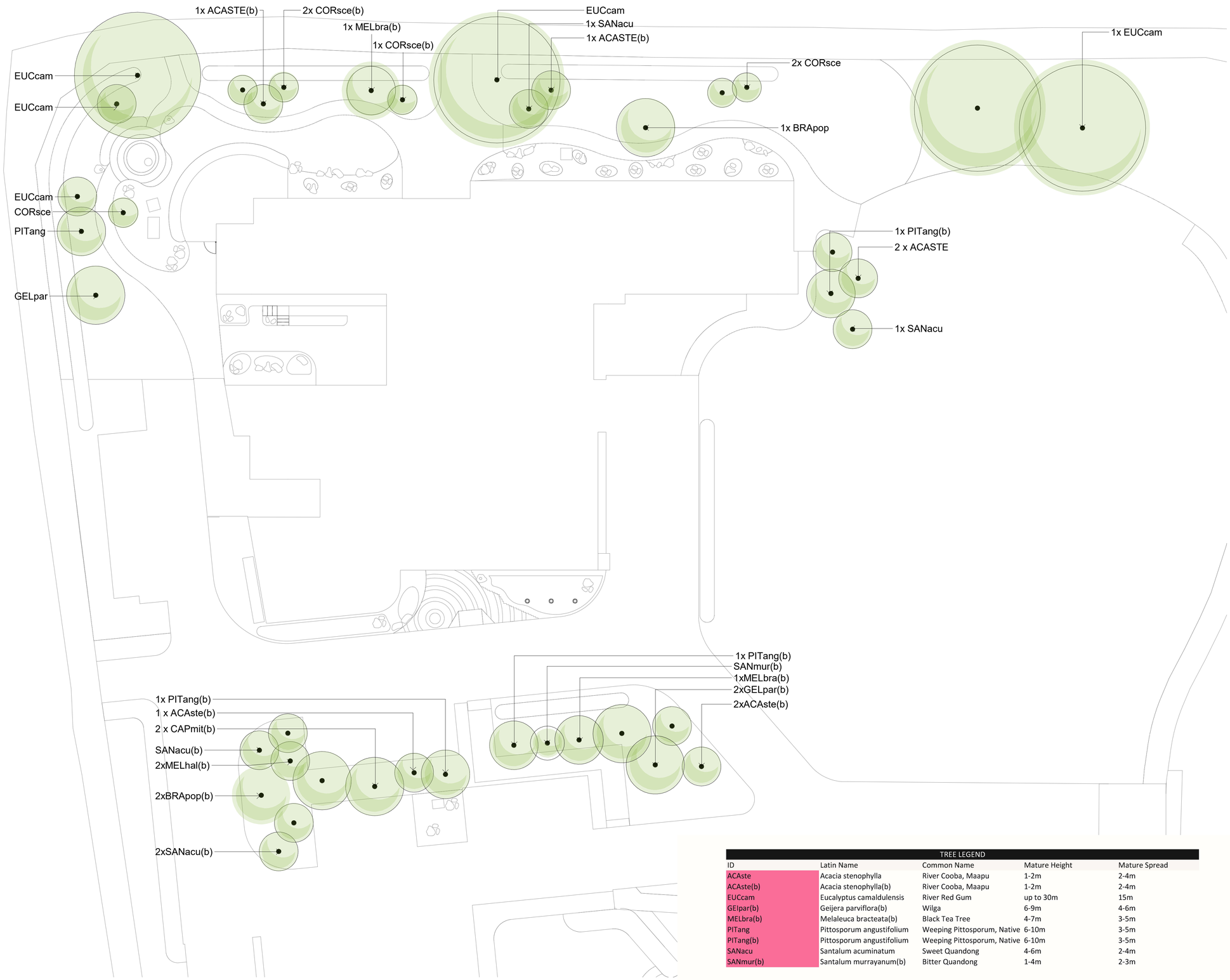

TREE LEGEND				
ID	Latin Name	Common Name	Mature Height	Mature Spread
ACAste	Acacia stenophylla	River Cooba, Maapu	1-2m	2-4m
ACAste(b)	Acacia stenophylla(b)	River Cooba, Maapu	1-2m	2-4m
EUCcam	Eucalyptus camaldulensis	River Red Gum	up to 30m	15m
GElpar(b)	Geijera parviflora(b)	Wilga	6-9m	4-6m
MELbra(b)	Melaleuca bracteata(b)	Black Tea Tree	4-7m	3-5m
PITang	Pittosporum angustifolium	Weeping Pittosporum, Native	6-10m	3-5m
PITang(b)	Pittosporum angustifolium	Weeping Pittosporum, Native	6-10m	3-5m
SANacu	Santalum acuminatum	Sweet Quandong	4-6m	2-4m
SANmur(b)	Santalum murrayanum(b)	Bitter Quandong	1-4m	2-3m

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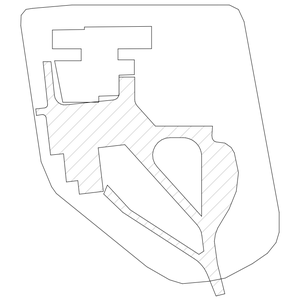
KEY PLAN



REF

PROJECT MANAGER
MOSTYN COPPER

ELECTRICAL ENGINEER
STEENSEN VARMING

CIVIL ENGINEER
TTW

HYDRAULIC ENGINEER
WSP

TRAFFIC CONSULTANT
SCT CONSULTING

COST MANAGER
GENUS ADVISORY

Issue

No.	Date	Description	Chkd
1	11/04/2023	REF ISSUE	JK
2	14/04/2023	REF ISSUE	JK

Changes to this Revision

NBRS
+61 2 9922 2344
nbrs.com.au
Nominated Architect:
Andrew Duffin NSW 5602
NBRS & Partners Pty Ltd VIC 51197
ABN 16 002 247 565

Project
WENTWORTH MSP

at
24 Hospital Rd
Wentworth NSW 2648
for
Health Infrastructure

Drawing Title
TREE PLANTING PLAN - MILESTONE 1A & 1B

Date 17/04/2023 10:45:08 AM
Scale 1 : 200 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1701

Revision
2

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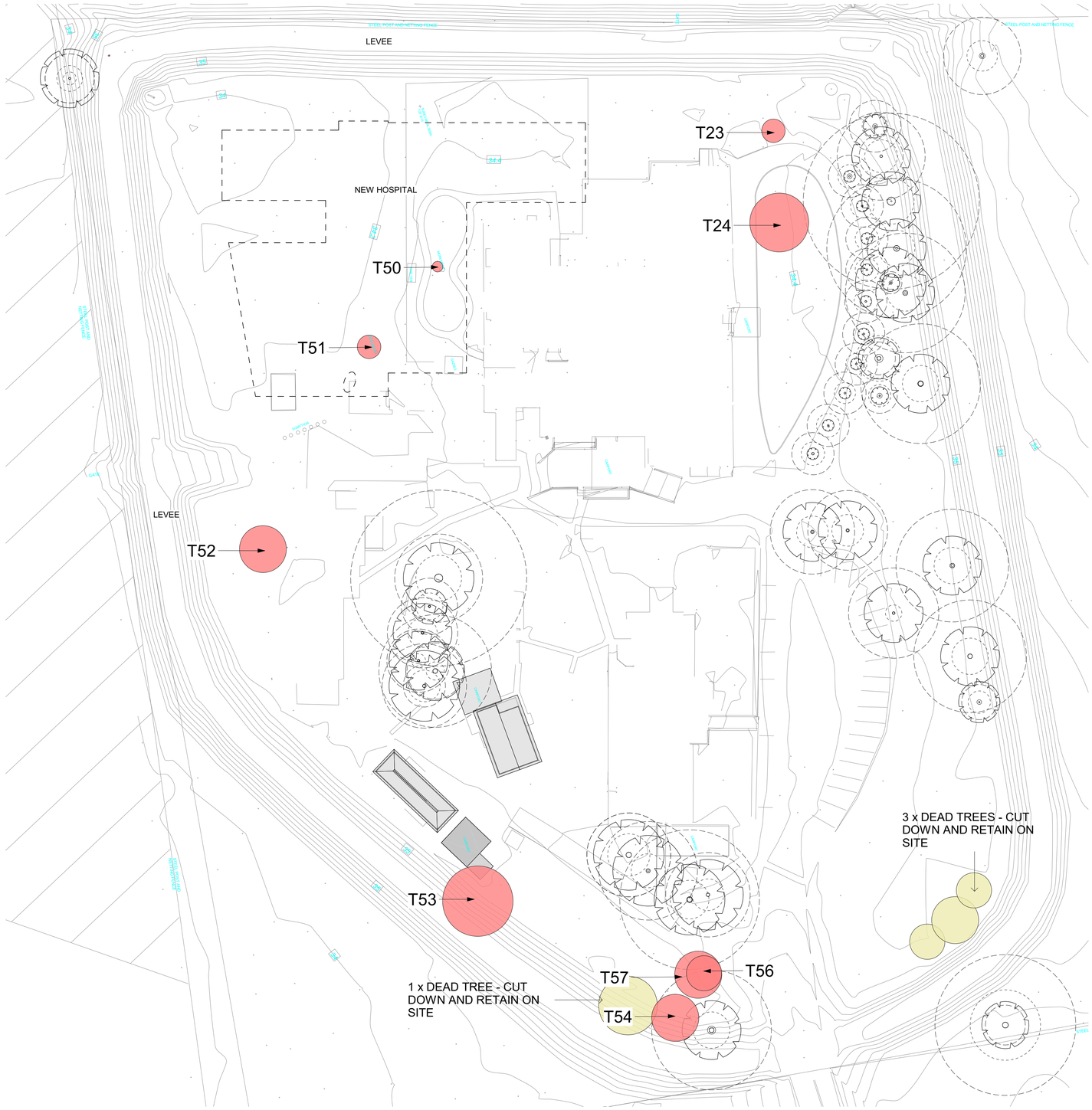

ARBORIST REPORT EXCERPT
REFER TO ARBORIST REPORT FOR FULL DETAILS

Tree No.	Species	DBH comb. (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Condition Rating	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)
23	*Olea europaea*	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for	3.6	2
24	*Melia azedarach* (White Cedar)	650	8	10	Fair	Poor	Late Mature	<5	Moderate	Priority for Removal	7.8	2.8
50	*Syagrus romanzoffianum* (Cocos Palm)	300	7	3	Good	Good	Mature	5-15	Low	Consider for Removal	4	n/a
51	*Eucalyptus peninsularis* (Cummins Mallee)	400	9	4	Good	Fair	Mature	15-40	Moderate	Consider for Retention	4.8	2.3
52	*Eucalyptus peninsularis* (Cummins Mallee)	500	8	6	Good	Fair	Mature	15-40	Moderate	Consider for Retention	6	2.5
53	*Eucalyptus sp.* (Eucalypt)	300 400	8	2	Good	Fair	Mature	15-40	Moderate	Consider for Retention	6	25
54	*Eucalyptus sp.* (Eucalypt)	200 200	7	4	Poor	Poor	Mature	<5	Low	Priority for Removal	3.5	2
55	*Eucalyptus sp.* (Eucalypt)	850	15	10	Good	Good	Mature	15-40	High	Priority for Retention	10.2	3.1
56	*Eucalyptus sideroxlon* (Mugga Ironbark)	200	8	3	Fair	Poor	Mature	5-15	Low	Consider for Removal	2.4	1.7
57	*Eucalyptus sp.* (Eucalypt)	600	15	8	Fair	Fair	Mature	5-15	Moderate	Consider for Retention	7.2	2.7
50	*Syagrus romanzoffianum* (Cocos Palm)	300	7	3	Good	Good	Mature	5-15	Low	Consider for Removal	4	n/a
51	*Eucalyptus peninsularis* (Cummins Mallee)	400	9	4	Good	Fair	Mature	15-40	Moderate	Consider for Retention	4.8	2.3
52	*Eucalyptus peninsularis* (Cummins Mallee)	500	8	6	Good	Fair	Mature	15-40	Moderate	Consider for Retention	6	2.5
53	*Eucalyptus sp.* (Eucalypt)	300 400	8	2	Good	Fair	Mature	15-40	Moderate	Consider for Retention	6	25
54	*Eucalyptus sp.* (Eucalypt)	200 200	7	4	Poor	Poor	Mature	<5	Low	Priority for Removal	3.5	2
55	*Eucalyptus sp.* (Eucalypt)	850	15	10	Good	Good	Mature	15-40	High	Priority for Retention	10.2	3.1
56	*Eucalyptus sideroxlon* (Mugga Ironbark)	200	8	3	Fair	Poor	Mature	5-15	Low	Consider for Removal	2.4	1.7
57	*Eucalyptus sp.* (Eucalypt)	600	15	8	Fair	Fair	Mature	5-15	Moderate	Consider for Retention	7.2	2.7

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GENUS ADVISORY

Issue

No.	Date	Description	Chkd
1	11/04/2023	REF ISSUE	JK
2	14/04/2023	REF ISSUE	JK
3	01/05/2023	REF ISSUE	JK

Changes to this Revision

NBRS
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Nominated Architect:
Andrew Duffin NSW 5602
NBRS & Partners Pty Ltd VIC 51197 ABN 16 002 247 565

Project
WENTWORTH MSP

at
24 Hospital Rd
Wentworth NSW 2648
for
Health Infrastructure

Drawing Title
TREE REMOVAL PLAN

Date 19/04/2023 9:52:21 AM
Scale 1 : 400 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1801

Revision
3

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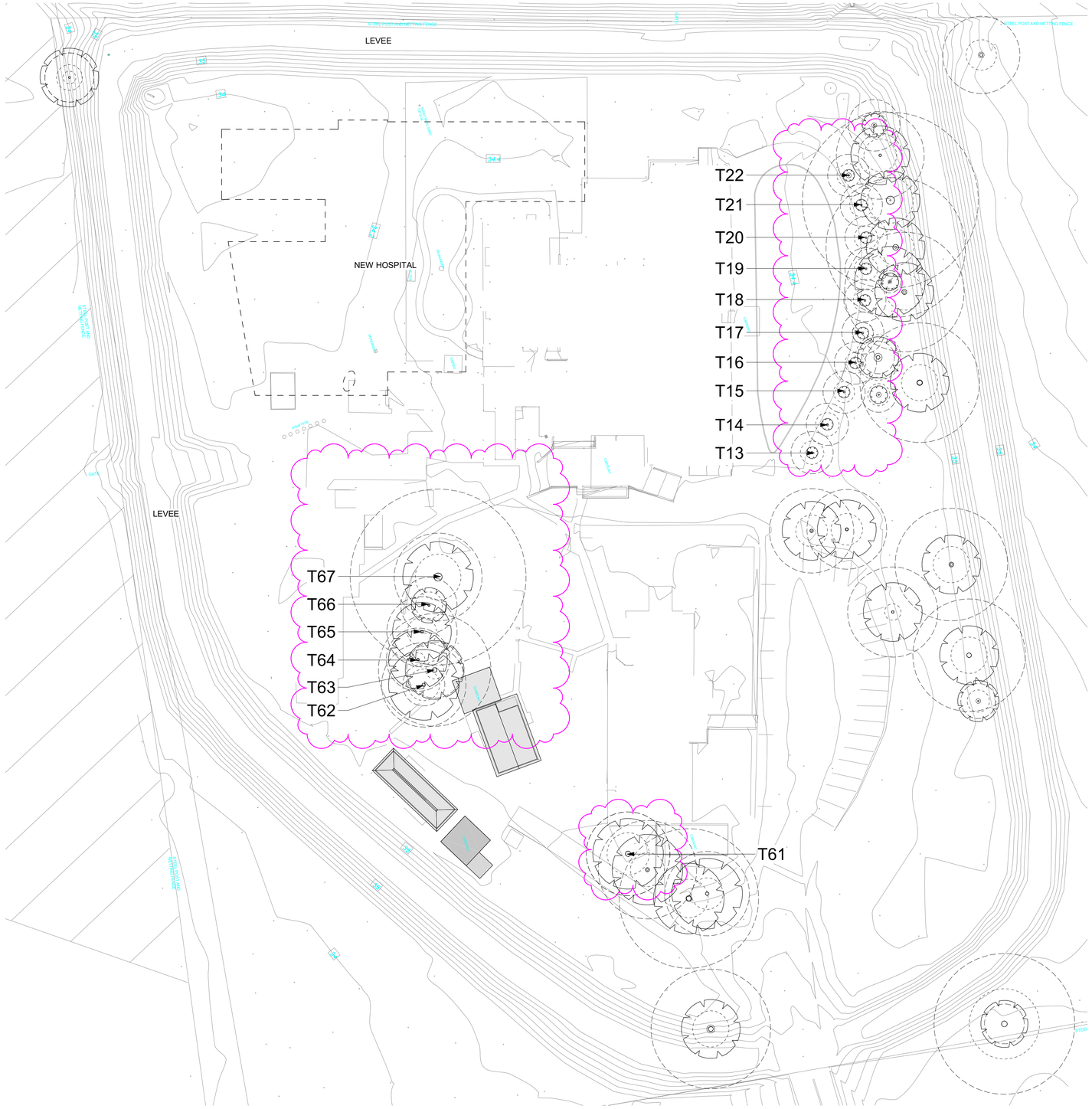

TREE RETENTION NOTES

TREE 61
ADJACENT BUILDING IS A PREFABRICATED DEMOUNTABLE. BUILDING CAN BE ROTATED ON SITE TO ACCOMMODATE FOR TREE CANOPY. BUILDING ACTS AS A CAP FOR ANY SOIL CONTAMINATION FOUND IN THE AREA. MARKER LAYER & 100-150MM GRAVEL UNDER BUILDING FOOTPRINT TO CAP ANY SOIL CONTAMINANTS IN THIS AREA. REMOVAL OF EXISTING SOIL SHOULD BE THE LAST RESORT.

TREE 62-67
THIS AREA IS BEING FILLED BY +300MM. ROADWAY TO BE EXCAVATED UNDER ARBORIST SUPERVISION. REFER TO CIVIL FOR EXTENT OF CUT/FILL. POTENTIAL TO PRUNE BRANCHES TO ACCOMMODATE BUILDING (UNDER SUPERVISION OF ARBORIST). REMOVAL OF TREE 67 IS A LAST RESORT.

TREE 13-22
NORTHERN PORTION OF RING ROAD RETAINED TO PROTECT TREE ROOTS.

ARBORIST REPORT EXCERPT

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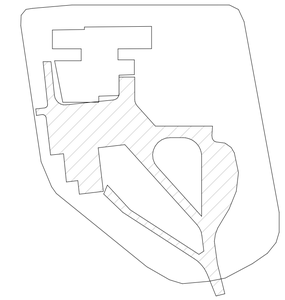
13	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
14	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
15	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
16	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
17	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
18	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
19	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
20	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
21	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
22	*Olea europaea* (European Olive)	300av	4	2	Good	Fair	Mature	15-40	Low	Consider for Removal	3.6	2
62	*Pinus pinea* (Stone Pine)	600	18	12	Good	Good	Mature	15-40	Moderate	Consider for Retention	7.2	2.7
63	*Lagunaria patersonia* (Norfolk Island Hibiscus)	800	12	5	Good	Fair	Mature	15-40	Moderate	Consider for Retention	9.6	3.1
64	*Pinus pinea* (Stone Pine)	450	15	10	Fair	Fair	Mature	5-15	Moderate	Consider for Retention	5.4	2.4
65	*Pinus pinea* (Stone Pine)	500	15	10	Fair	Fair	Mature	5-15	Moderate	Consider for Retention	6	2.5
66	*Pinus pinea* (Stone Pine)	400	12	6	Fair	Fair	Mature	15-40	Low	Consider for Removal	4.8	2.3
67	*Pinus pinea* (Stone Pine)	800 800 800	17	12	Good	Good	Mature	15-40	High	Priority for Retention	15	3.9

NBRS

KEY PLAN



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Drawing Title
TREE RETENTION PLAN

Date 17/04/2023 10:45:14 AM
Scale 1 : 400 @ A1

Drawing Reference
21325-NBRS-LS-DD-REF-1802

Revision
2

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