

# Cooks to Cove Greenway, In-corridor Works: MMP Exclusion Report

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**Gartner Rose**

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## DOCUMENT TRACKING

|                        |   |
|------------------------|---|
| <b>Project Name</b>    | Cooks to Cove Greenway, In-corridor Works |
| <b>Project Number</b>  | 23WOL4973                                 |
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| <b>Status</b>          | <b>Final</b>                              |
| <b>Version Number</b>  | <b>V1</b>                                 |
| <b>Last saved on</b>   | <b>12 February 2024</b>                   |

This report should be cited as 'Eco Logical Australia 2024. *Cooks to Cove Greenway, In-corridor Works MMP Exclusion Report.* Prepared for Gartner Rose.'

## ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Rodney Armistead and Gartner Rose.

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Template 2.8.1

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## Abbreviations

| Abbreviation | Description   |
|--------------|---|
| CMMP         | Construction Microbat Management Plan                           |
| ELA          | Eco Logical Australia   |
| IWC          | Inner West Council  |
| LBB          | Large Bent-winged Bat ( <i>Miniopterus orianae oceanensis</i> ) |
| LGA          | Local Government Area   |
| MMP          | Microbat Management Plan  |
| REF          | Review of Environmental Factors                                 |

## 1. Background

Eco Logical Australia Pty Ltd (ELA) was engaged by Gartner Rose to conduct monitoring of microbats in accordance with the Review of Environmental Factors (REF), Construction Microbat Management Plan (CMMP) (ELA 2021) and Microbat Management Plan (MMP) (ELA 2021) for the proposed construction of a pedestrian pathway perpendicular to a known Large Bent-winged Bat (*Miniopterus orianae oceanensis*, LBB) roost as part of the Cooks to Cove Greenway In-Corridor works package (Figure 1).

LBB is a Microchiropteran bat species (microbats) listed as Vulnerable under the *Biodiversity Conservation Act 2016* (BC Act). The species have been recorded within the Sydney Basin using suitable artificial structures (e.g. culverts and bridges) as roosting habitat, with such structures being present in Gadigal Reserve. Larger numbers of bats are typically present from March to October. Outside of this, some individuals remain in the Sydney Basin, but most congregate at a few known maternity caves scattered across NSW. Due to the small number of known maternity caves and the large number of bats known to use these caves for breeding, the protection of these caves is of high importance to the conservation of the species. However, winter roosting sites are also important as locations where bats can hibernate and reduce energy requirements and large winter roosts may also be significant for both species.

The LBB roost located within the Cooks Grove to Greenway development has been found to consistently contain a significant number of LBB roosting between March and October (70-90 bats), with lower numbers observed during summer (4-6 bats).

A CMMP and MMP were prepared by ELA to reduce the potential impacts to LBB resulting from the proposed Greenway In-Corridor works package. This MMP included the requirement of pre-exclusion microbat surveys of the Cadigal Reserve roost and conduct a staged exclusion of LBB from the roost to ensure that no bats occupied the roost during construction works near the roost. The results of these surveys and details of the exclusion process have been detailed in Section 2 and 3 and Appendix A. Photos of the exclusion process have been included in Appendix B.

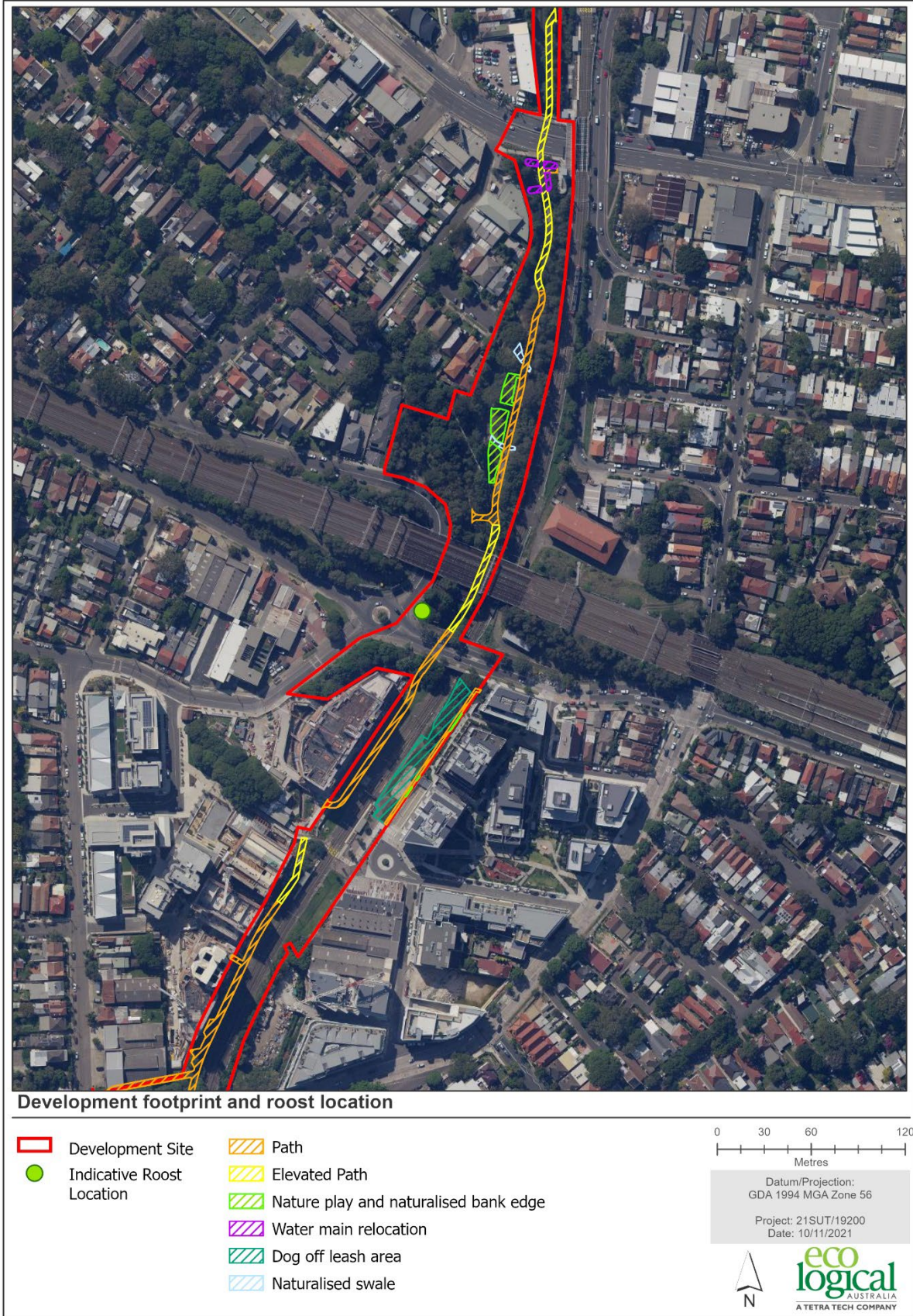


Figure 1: Roost Location (MMP ELA 2021)

## 2. Pre-Exclusion Surveys

Pre-exclusion surveys were conducted on the 19 October and the 2, 9 and 10 November 2023, by ecologists Dr Rodney Armistead, Kody Kemp and Taylor Benny. Surveys were conducted from approximately 6:50pm to 8:20pm each night. The pre-exclusion surveys aimed to inform exclusion timelines and bat activity within the roost.

These surveys were conducted using Anabat Swift and Anabat walkabout ultrasonic bat detectors and a FLIR530 Thermal Camera to determine microbat activity. Roost emergence bat numbers were recorded each night. The number of bats emerging peaked at a maximum of 82 bats the 10<sup>th</sup> of November (Table 1).

**Table 1: Pre-exclusion monitoring**

| Date        | Number of bats recorded | Survey time   | Temperature   |
|-------------|-------------------------|---------------|---|
| 19 October  | 20 exiting the roost    | 6:50pm-8:20pm | 19 degrees  |
| 2 November  | 10 exiting the roost    | 6:50pm-8:20pm | 20 degrees  |
| 9 November  | 40 exiting the roost    | 6:50pm-8:20pm | 22 degrees* noted thunderstorm passed prior to survey |
| 10 November | 82 exiting the roost    | 6:50pm-8:20pm | 23 degrees  |

### 3. Exclusion surveys

Following the initial four nights of pre-exclusion monitoring, the exclusion device was installed on the 13 November 2023. Exclusion of the Cadigal Reserve LBB roost began on 13 November 2023 but ceased on 15 November 2023 due to weather conditions and large numbers of LBB present during exclusion monitoring (Table 2). A secondary pre-exclusion survey was conducted on the 27 November 2023 following easing weather conditions to allow the exclusion to be restarted on 6 December (Table 3). Figures in Appendix B illustrate the exclusion process at various stages.

During these exclusion surveys, two long-term deceased microbats were discovered on the floor of the roost. These microbats were largely decayed and dehydrated. The condition of the bats demonstrate that the fatalities were not a result of recent activity around the roost. The bat remains were removed from the roost and disposed of appropriately.

**Table 2: Microbat Exclusion surveys Round 1**

| Date                | Number of bats recorded   | Percentage closed  | Survey time     | Temperature                              |
|---------------------|---|--|-----------------|--|
| 13 November – Night | 29  | 0%   | 6:50pm – 8:20pm | 20 degrees                               |
| 14 November – Dawn  | No displaced/disrupted bats   | 40%  | 5:30am – 6:30am | 16 degrees                               |
| 14 November – Night | 40  | 40%, then dropped to 70%   | 6:50pm – 8:20pm | 23 degrees                               |
| 15 November – Dawn  | Approximately 10 bats recorded to be displaced/disrupted*                 | 70%, exclusion curtain was lifted to 50% to allow displaced bats to re-enter roost | 5:30am – 7:00am | 20 degrees                               |
| 15 November – Night | 25 No further exclusion conducted; exclusion device lifted to 5% coverage | 70%, then dropped to 80%   | 6:50pm – 8:20pm | 22 degrees* noted potential thunderstorm |

**Table 3: Microbat Exclusion Surveys Round 2**

| Date                     | Number of bats recorded       | Percentage closed  | Survey time     | Temperature |
|--------------------------|-------------------------------|--------------------|-----------------|-------------|
| 27 November 2023         | 40 – exited roost             | 0%                 | 7:15pm – 8:45pm | 24 degrees  |
| 6 December 2023 – Night  | 55 – exited roost             | 0, dropped to 40%  | 7:20pm – 8:50pm | 23 degrees  |
| 7 December 2023 – Dawn   | 5 – potentially entered roost | 0%                 | 5:00am – 6:00am | 16 degrees  |
| 7 December 2023 – Night  | 3 – exited roost              | 40% dropped to 60% | 7:55pm – 8:55pm | 26 degrees  |
| 8 December 2023 – Dawn   | 2 – all entered roost         | 60%                | 5:00am – 6:00am | 20 degrees  |
| 11 December 2023 – Night | 2 – all exited roost          | 60% dropped to 70% | 7:25pm – 8:55pm | 24 degrees  |
| 12 December – Dawn       | 2 – all entered roost         | 70%                | 5:00am – 6:00am | 22 degrees  |
| 12 December – Night      | 2 – all exited roost          | 70% dropped to 80% | 7:25pm – 8:55pm | 26 degrees  |
| 13 December – Dawn       | 2 – all entered roost         | 80%                | 5:00am – 6:00am | 19 degrees  |
| 13 December – Night      | 1 – all exited roost          | 90 – 95%           | 7:25pm – 8:55pm | 20 degrees  |



| Date                  | Number of bats recorded           | Percentage closed    | Survey time       | Temperature |
|-----------------------|-----------------------------------|----------------------|-------------------|-------------|
| 14 December – Dawn    | No bats entered roost             | 95%                  | 5:00am – 6:00am   | 24 degrees  |
| 14 December – Night   | No bats entering or exiting roost | 95%, dropped to 100% | 7:25pm – 10:30 pm | 34 degrees  |
| 15 December – Dawn    | No bats within the roost or area  | 100%                 | 5:00am – 6:00am   | 22 degrees  |
| 15 December – Morning | No bats present in the roost      | 100% - fixed curtain | 7:00am – 9:30am   | 23 degrees  |

## 4. Conclusion and Recommendations

The exclusion process and MMP have been successful in excluding bats to minimise the potential for construction impacts utilising the Cadigal reserve roost. The existing known roosts and augmented habitat installed in nearby locations on 24 August 2023 (ELA, 2023), reduced the chances that bats would be unable to find suitable alternative shelter following the exclusion from this roost.

Recommendations for short to long-term impact mitigation has been outlined within the MMP, these measures include removing the exclusion device following the return of microbats from their maternity roost (once tunnelling and piling works are completed), allowing the microbats access to suitable roost conditions during winter. The MMP outlines impact mitigation recommendations regarding the design, noise control and lighting to allow microbats to successfully re-establish within this roost following the completion of all construction works. Appendix B of the Microbat Management Plan (ELA, 2021) outlines an Adaptive MMP for the post construction period for the Cadigal Reserve Roost.

If not already in place, Inner West City Council may wish to formulate a plan for managing threatened microbat species within the area surrounding the Cadigal reserve roost, particularly in regard to public access and future restoration or conservation works. It is strongly recommended that any future conservation and/or construction works that may impact Bent-winged Bats or potential roost habitat are scheduled to avoid the cooler months when bat numbers at Cadigal Reserve are likely at their peak. The ideal timing for works to occur would be from the middle of November occurring after the migration of most Bent-winged Bats to the summer and maternity roosts outside of the Sydney basin (September to October) and before the bats return to Sydney (March). Works that may impact bat roosts in the future should consider including a monitoring component and a Monitoring Trigger Action Response Plan or similar to identify if microbats are being impacted and then implement appropriate actions to reduce potential impacts to roosting microbats.

Collection of additional information on the microbats using the Cadigal Reserve and surrounding area roosting habitat would be useful to provide insight into the movements and connections of microbats between local roosts. Regular monitoring of the known and potential roosts at Cadigal Reserve and surrounding areas should reveal information on when bat populations at the roosts increase, decrease or disperse each year and reveal trends in the numbers of bats utilising each roost. This information would be useful within any project aiming to monitor or reduce impacts to microbat populations during future works and may provide an indication of general trends within the wider population of Large Bent-winged Bats within the Sydney Basin that can also be taken into consideration for long-term management strategies.

## 5. References

Eco Logical Australia 2023. *Cook to Cove Greenway – Compensatory Microbat Habitat Installation Report*.

Eco Logical Australia 2021. *Greenway In-Corridor Works - Microbat Management Plan*. Prepared for Inner West Council

## Appendix A Activity Log

**Table 4: Activity Log**

| Activity   | Staff                            | Date  | Results   |
|--|----------------------------------|---|---|
| <p><b>Pre-exclusion monitoring:</b><br/>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p>  | Kody Kemp<br>Rodney Armistead    | 19 October – Night<br>6:50pm – 8:20pm   | 20 bats recorded exiting the roost  |
| <p><b>Pre-exclusion monitoring:</b><br/>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p>  | Kody Kemp<br>Rodney Armistead    | 2 November – Night<br>6:50pm – 8:20pm   | 10 bats recorded exiting the roost  |
| <p><b>Pre-exclusion monitoring:</b><br/>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p>  | Taylor Benny<br>Rodney Armistead | 9 November – Night<br>6:50pm – 8:20pm   | 40 bats recorded exiting the roost  |
| <p><b>Pre-exclusion monitoring:</b><br/>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p>  | Taylor Benny<br>Rodney Armistead | 10 November – Night<br>6:50pm – 8:20pm  | 82 bats recorded exiting the roost  |
| <p><b>Exclusion Device installation:</b><br/>Supervision of Gartner Rose staff installing the tarpaulin utilised for microbat exclusion. Ensuring that the right tension is used, is of reasonable durability and is secured around the edges with no gaps.</p>  | Kody Kemp<br>Rodney Armistead    | 13 November – Day<br>9:00am – 11:00 am  |   |
| <p><b>Exclusion monitoring:</b><br/>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.<br/>Dropped exclusion device down to 40% coverage of roost exit.</p>   | Tara Dowling<br>Rodney Armistead | 13 November – Night<br>6:50pm – 8:20pm<br>Exclusion device dropped following survey | 29 bats recorded exiting the roost. Long-term dead bat removed from roost |
| <p><b>Exclusion monitoring:</b><br/>Visual checks prior to and after sunrise to determine presence of microbats re-entering roost following exclusion and if there were any displaced or distressed microbats.<br/>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p> | Kody Kemp<br>Tara Dowling        | 14 November – Dawn<br>5:30am – 6:30am   | No displaced/disrupted bats   |
| <p><b>Exclusion monitoring:</b><br/>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.<br/>Dropped exclusion device down to 70% coverage of roost exit.</p>   | Tara Dowling<br>Rodney Armistead | 14 November – Night<br>6:50pm – 8:20pm<br>Exclusion device dropped following survey | 40 bats recorded exiting the roost  |

| Activity  | Staff   | Date  | Results  |
|---|---|---|--|
| <p><b>Exclusion monitoring:</b></p> <p>Visual checks prior to and after sunrise to determine presence of microbats re-entering roost following exclusion and if there were any displaced or distressed microbats.</p> <p>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p>                          | Kody Kemp<br>Tara Dowling                     | 15 November – Dawn<br>5:30am – 7:00am   | Approximately 10 bats recorded to be displaced/disrupted*.<br><br>Exclusion device lifted to allow bats to reenter roost |
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p> <p>Dropped exclusion device down to 80% coverage of roost exit</p>   | Tara Dowling<br>Rodney Armistead              | 15 November – Night<br>6:50pm – 8:20pm<br><br>Exclusion device lifted to 5% on 16 November  | 25 bats recorded exiting the roost. No further exclusion conducted; exclusion device lifted to 5% coverage               |
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p>  | Kody Kemp<br>Taylor Benny                     | 27 November 2023 – Night<br>7:15pm – 8:45pm   | 40 bats recorded exiting the roost   |
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p> <p>Roost check conducted with ultrasonic monitor and thermal camera to ensure the roost was empty prior to dropping exclusion device.</p> <p>Dropped exclusion device down to 40% coverage of roost exit</p> | Claire Plunkett<br>Rodney Armistead           | 6 December 2023 – Night<br>7:20pm – 8:50pm<br><br>Exclusion device dropped following survey | 55 bats recorded exiting the roost   |
| <p><b>Exclusion monitoring:</b></p> <p>Visual checks prior to and after sunrise to determine presence of microbats re-entering roost following exclusion and if there were any displaced or distressed microbats.</p> <p>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p>                          | Kody Kemp<br>Taylor Benny<br>Crystal Marsland | 7 December 2023 – Dawn<br>5:00am – 6:00am   | 5 bats recorded exiting the roost  |
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p> <p>Roost check conducted with ultrasonic monitor and thermal camera to ensure the roost was empty prior to dropping exclusion device.</p>  | Claire Plunkett<br>Rodney Armistead           | 7 December 2023 – Night<br>7:55pm – 8:55pm<br><br>Exclusion device dropped following survey | 3 bats recorded exiting the roost  |

| Activity   | Staff   | Date   | Results   |
|--|---|--|---|
| Dropped exclusion device down to 60% coverage of roost exit  |   |  |   |
| <p><b>Exclusion monitoring:</b></p> <p>Visual checks prior to and after sunrise to determine presence of microbats re-entering roost following exclusion and if there were any displaced or distressed microbats.</p> <p>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p>                           | Kody Kemp<br>Taylor Benny<br>Crystal Marsland | 8 December 2023 – Dawn<br>5:00am – 6:00am  | 2 bats recorded exiting the roost   |
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p> <p>Roost check conducted with ultrasonic monitor and thermal camera to ensure the roost was empty prior to dropping exclusion device.</p> <p>Dropped exclusion device down to 70% coverage of roost exit.</p> | Kody Kemp<br>Rodney Armistead                 | 11 December 2023 – Night<br>7:25pm – 8:55pm<br>Exclusion device dropped following survey | 2 bats recorded exiting the roost. Second long-term dead bat discovered during intense roost check. |
| <p><b>Exclusion monitoring:</b></p> <p>Visual checks prior to and after sunrise to determine presence of microbats re-entering roost following exclusion and if there were any displaced or distressed microbats.</p> <p>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p>                           | Taylor Benny<br>Crystal Marsland              | 12 December – Dawn<br>5:00am – 6:00am  | 2 bats recorded exiting the roost   |
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p> <p>Roost check conducted with ultrasonic monitor and thermal camera to ensure the roost was empty prior to dropping exclusion device.</p> <p>Dropped exclusion device down to 80% coverage of roost exit.</p> | Kody Kemp<br>Rodney Armistead                 | 12 December – Night<br>7:25pm – 8:55pm<br>Exclusion device dropped following survey      | 2 bats were recorded exiting the roost<br>Existing long-term dead bat removed from roost            |
| <p><b>+Exclusion monitoring:</b></p> <p>Visual checks prior to and after sunrise to determine presence of microbats re-entering roost following exclusion and if there were any displaced or distressed microbats.</p> <p>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p>                          | Taylor Benny<br>Crystal Marsland              | 13 December – Dawn<br>5:00am – 6:00am  | Potentially 2 bats were recorded entering roost   |

| Activity  | Staff                                       | Date   | Results   |
|---|---|--|---|
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity.</p> <p>Roost check conducted with ultrasonic monitor and thermal camera to ensure roost was empty prior to dropping exclusion device.</p> <p>Dropped exclusion device down to 90-95% coverage of roost exit.</p>   | <p>Kody Kemp</p> <p>Rodney Armistead</p>    | <p>13 December – Night</p> <p>7:25pm – 8:55pm</p> <p>Exclusion device dropped following survey</p>   | <p>1 bat were recorded exiting roost</p>  |
| <p><b>Exclusion monitoring:</b></p> <p>Visual checks using thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity prior to and after sunrise to determine presence of microbats re-entering roost following exclusion and if there were any displaced or distressed microbats.</p> <p>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p>   | <p>Taylor Benny</p> <p>Crystal Marsland</p> | <p>14 December – Dawn</p> <p>5:00am – 6:00am</p>   | <p>No bats were recorded entering roost, no bat activity recorded in the area</p>                             |
| <p><b>Exclusion monitoring:</b></p> <p>Thermal imagery camera and two ultrasonic recorders set up facing outwards from the roost entrance to record microbat activity.</p> <p>Roost check conducted with ultrasonic monitor and thermal camera to ensure there are no bats present within the roost, when arrived on site, following survey prior to exclusion activities and following exclusion, and roost was empty prior to dropping exclusion device.</p> <p>Dropped exclusion device down to 100% coverage of roost exit.</p> | <p>Kody Kemp</p> <p>Rodney Armistead</p>    | <p>14 December – Night</p> <p>7:25pm – 10:30pm</p> <p>Exclusion Device dropped to 100% at 9.00pm. Survey was completed for 1 hour following 100% exclusion</p> | <p>No bats were recorded within the roost at any point, no microbat activity recorded throughout the area</p> |
| <p><b>Exclusion monitoring:</b></p> <p>Visual checks using Thermal imagery camera and two ultrasonic recorders set up facing the roost entrance to record microbat activity prior to and after sunrise to determine presence of microbats re-entering roost</p>   | <p>Taylor Benny</p> <p>Crystal Marsland</p> | <p>15 December – Dawn</p> <p>5:00am – 6:00am</p>   | <p>No distressed or displaced bats recorded within the area</p>   |

| Activity  | Staff                                       | Date   | Results  |
|---|---|--|--|
| <p>following exclusion, and if there were any displaced or distressed microbats.</p> <p>Roost check with ultrasonic monitor and thermal camera to ensure there are no bats present within the roost.</p> <p>Checking exclusion material is in reasonable condition and no microbats are injured or behind the exclusion device.</p>                   |   |  |  |
| <p><b>Exclusion supervision:</b></p> <p>Placement of ultrasonic recorder within the roost to monitor bat activity for four nights following permanent exclusion.</p> <p>Supervision of construction activities to permanently fix the curtain.</p>  | <p>Taylor Benny</p> <p>Crystal Marsland</p> | <p>15 December – Morning<br/>7:00am – 9:30am</p> | <p>Exclusion device permanently fixed with no gaps within the material</p>   |
| <p><b>Exclusion device monitoring:</b></p> <p>Collection of ultrasonic monitor within the roost.</p> <p>Visual inspection of exclusion device to ensure integrity and no microbats are injured or behind the exclusion device.</p> <p>Roost check with ultrasonic monitor and thermal camera to ensure there are no bats present within the roost</p> | <p>Kody Kemp</p> <p>Rodney Armistead</p>    | <p>21 December – Morning 9:30 am – 10:30 am</p>  | <p>Exclusion device intact with no gaps present. No bats were found residing within the roost.</p> <p>Ultrasonic Call Analysis revealed that of the six files logged on the Anabat Swift left within the roost during the post exclusion monitoring, no bat calls were recorded during this time</p> |



## Appendix B Exclusion Photos



Figure 2: Installed exclusion device prior to lowering



Figure 3: Exclusion Device 40% closed



Figure 4: Curtain lifted to allow bats back into roost 50%



Figure 5: Left hand side of pipe completely closed



Figure 6: Exclusion device 75% closed



Figure 7: Exclusion device 100%

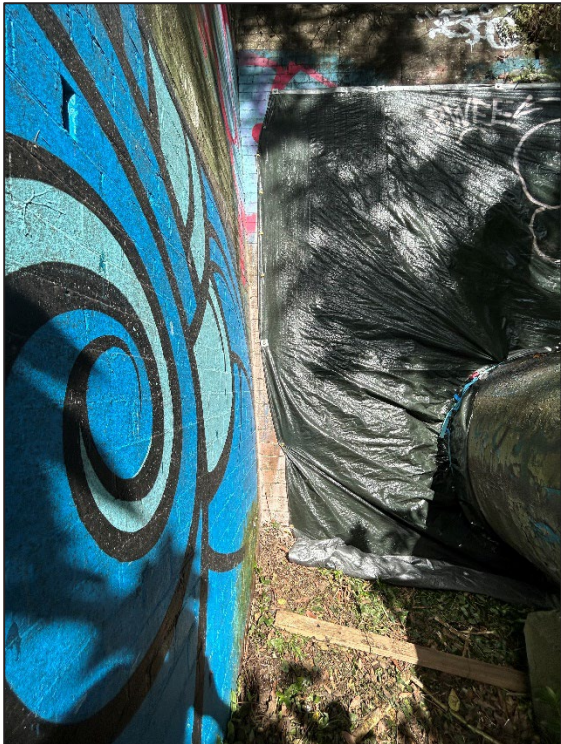


Figure 8: Permanent exclusion LHS of the water pipe



Figure 9: Permanent exclusion around water pipe

