

Arboricultural Report

Unicorn Falls and Day Camping Area

Client:
National Parks and Wildlife Services

Report compiled by
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Table of Contents

1.	Introduction	3
2.	Scope	3
3.	Method	3
4.	Description Day Use Area	4
5.	QTRA Risk Assessment Day Use Area	5
6.	Appraisal Day Use Area	6
7.	Recommendations Day Use Area	7
8.	Description Camping Area	8
9.	QTRA Risk Assessment Camping Area	9
10.	Appraisal Camping Area	10
11.	Recommendations Camping Area	11
12.	Disclaimer.	12
13.	Bibliography	12
14.	About the Author	12
15.	Attachment 1. Location Map.	13
16.	Attachment 2. Day Use Area.	14
17.	Attachment 3. Day Use Area Detail	15
18.	Attachment 4. Camping Area Survey Detail.	16
19.	Attachment 5. Photos.	17

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1. Introduction

Peter Gray has compiled this report on request from National Parks and Wildlife Services. The Unicorn Falls car park and access to the falls is planned to be upgraded. The Unicorn Falls Camping Area is also planned to be built. The facilities are in a forested area of the Jerusalem National Park and have a significant trees near the planned upgrades.

2. Scope

This report assesses a number of trees adjacent to the new facilities. The trees have been assessed for their suitability to be retained in the upgrade. The health and vitality of the trees is assessed and the risk to the public and the new infrastructure from the trees is calculated. The two areas have both been included in this report.

The Australian Standard *AS 4970-2009 Protection of trees on development sites* gives guidance for the protection of trees during construction and for the calculation and protection of tree protection zones [TPZ]. The likely affect of the planned development on the trees and the protection of the TPZ's have not been included in this report.

3. Method

The trees were assessed visually from the ground. The diameter at breast height (DBH) was measured at 1.4 m above ground level with a girthing tape. The height of the trees was estimated. The methods recommended in the Australian Standard *AS 4970-2009 Protection of trees on development sites* was used assess the trees.

The health and condition of the trees was assessed using the Visual Tree Assessment method (Mattheck & Breloer 2003). This is a method of assessing the trees using the body language or shape and features of the trees to indicate their condition. These tree shapes or body language are a reliable indicator of the underlying condition of that part of the tree. The trees were identified using the signs and features present at the time of inspection. A risk assessment was carried out using Quantified Tree Risk Assessment [QTRA] (Ellison 2016).

The information in this report is derived from a site visit carried out on 17th December, 2019. Plans and drawings were supplied by National Parks and Wildlife Services. The drawings include:

- *Unicorn Falls*. Newsclapes Design. 05/2019.
- *Unicorn Falls Day Use Survey*. Newsclapes Design. 05/2019.
- *Unicorn Falls Campground-Demolition Plan*. Newsclapes Design. 05/2019

4. Description Day Use Area

The site includes the car parking area that is planned to be upgraded and a toilet built. There is a path way through the forest to the creek and water falls. The trees were inspected by way of a walk over survey. Trees that were considered to have some issue that may affect their suitability for retention were assessed individually. Where possible the trees were identified but the height and size of some of the trees made a positive identification impossible.

The trees at Unicorn Falls Day Use Area are given in **Table 1. Day Use Area Tree Data** below.

Table 1. Day Use Area Tree Data.

Tree #	Name	Condition	Height m	DBH mm	Crown m	TPZ m	Comments
1	Sally Wattle <i>Acacia melanoxylon</i>	Fair	8	320	7	3.8	Included branch junction
2	Rose Walnut <i>Endiandra discolor</i>	Good	10	380	5	4.6	Growing on a mound of soil
3	Brushbox <i>Lophostemon confertus</i>	Good	35	1000	10	12.0	Large tree
4	Dead tree	Dead	10	490	4	-	An orchid growing in the tree has recently fallen off
5	Rainforest sp	Good	15	550	10	6.6	Leaning
6	Coachwood <i>Ceratopetalum apetalum</i>	Good	12	550	8	6.6	Hollow in the base
7	Rainforest sp	Good	10	320	8	3.8	Leaning near the path to the creek
8	Rainforest sp	Good	14	450	8	5.4	Hollow in the base

(Harden et al 2009).

It is planned to construct a toilet facility on the northern side of the new carpark. There are three tall Gum trees (possibly Blackbutt *Eucalyptus pilularis*) close to the proposed construction area. The final location of the toilet block has not been determined.

Approximately 200 m from the turnoff to the day use area, on the northern side of the road a Gum tree is growing with a lean over the road. The tree appears to be an epicormic shoot that has grown up after the original tree has fallen. The tree has an elevated likelihood of failure in high winds. If it failed it would fall onto the road.

5. QTRA Risk Assessment Day Use Area

Quantified Tree Risk Assessment (QTRA) was used to assess the risk posed by trees. The risk assessment first looks at the target that could be injured or damaged if the tree failed. The size of the part likely to fail is considered and finally the likelihood of the tree (or part of the tree) failing is considered. A probability is assigned to each value and then a probability of risk of harm in the next calendar year is calculated. This can then be compared with benchmark acceptable risk levels and risks from other hazards.

QTRA is a risk assessment process that calculates the risk as a probability and then compares that risk with benchmark figures that are considered to be acceptable. If the risk is assessed as being greater than 1/10,000 it is considered to be unacceptable and action should be taken to lower it. Where the risk is 1/1,000,000 or less it is broadly acceptable and it is considered unreasonable to require action to be taken to lower it even further. Where it between 1/1,000,000 and 1/10,000 it is tolerable. It is considered that any action required to lower it should not be disproportionate to the risk. When a risk is as Low As is Reasonable Practicable (ALARP) it is considered to be acceptable (Ellison 2016).

The results of the risk assessment are reported as a risk index. For example a risk index of 500K is 1/500,000.

The results of the risk assessment are detailed in **Table 2. QTRA Risk Assessment.**

Table 2. QTRA Risk Assessment Day Use Area.

Tree #	Name	Comments	Target Range	Size Range	Probability Range	Risk Index	Recommendations
1	Sally Wattle <i>Acacia melanoxylon</i>	Included junction. Leader leaning over planned car park	3	-	3	30K	Remove tree
2	Rose Walnut <i>Endiandra discolor</i>	Base undermined	3	1	6	<1M	Retain tree
3	Brushbox <i>Lophostemon confertus</i>	Large tree in good condition. Possible dead stick drop	3	4	3	<1M	No action
4	Dead tree	Whole tree failure at the base	3	1	3	40K	Remove tree to at least 2 m high
5	Rainforest sp	Leaning	4	1	6	<1M	No action
6	Coachwood <i>Ceratopetalum apetalum</i>	Hollow at the base	3	1	5	<1M	No action
7	Rainforest sp	Leaning near proposed path	3	2	5	<1M	No action
8	Rainforest sp	Decay at the base	4	1	5	<1M	No action

Headings and Abbreviations

Tree #:	Unique tree identification number.
Name:	Common name and species.
Target Range:	Highest value target that the most significant part likely to fail could strike. Ranges 1-6. 1= high, 6=low occupancy.
Size Range:	Size of the part likely to impact the target. 1-4. 1 = large, 4 = small.
Probability Range:	Probability of failure within 12 months. Ranges 2 - 6. 2 = high, 6 = low.
Risk Index	e.g. Risk index 20K = risk of significant harm = 1/20,000.

The risk from each tree was calculated to be the risk from that type of failure considered to be the most likely.

6. Appraisal Day Use Area

Tree # 1

Sally Wattle *Acacia melanoxylon*.

This is an over mature tree growing on the southern side of the existing car parking area. The tree has a co-dominant leader from 2 m high. The junction has included bark. The planned upgrade will not affect the area at the base of the tree however, if the tree or co-dominant leader failed it would fall into the planned car park area. The risk from the tree is calculated to be on the high end of the tolerable range. The condition of the tree is likely to worsen over time and the risk increase.

Tree # 2

Rose Walnut *Endiandra discolor*.

This is a young mature tree growing in or next to a pile of fill soil. The soil has eroded slightly leaving some roots exposed. The tree has adjusted to the erosion and is stable. The risk from the tree is acceptable. The planned construction of the new carpark will require some removal of this pile of fill. If the removal does not encroach to closer than 3 m of the tree, the tree is not expected to suffer any significant consequences. If the removal encroaches to 2 m or less from the centre of the base of the tree, the tree is likely to become unstable.

Tree # 3

Brushbox *Lophostemon confertus*.

Tall mature aged tree in good condition. The risk from this tree is acceptable.

Tree # 4

Dead tree.

The risk from this tree is calculated to be on the high end of the tolerable range.

Tree # 5.

Rainforest sp.

This tree is a mature aged and in good condition. The tree is leaning. The risk from the tree is calculated to be acceptable.

Tree # 6

This is a mature aged tree. It has a large cavity at the base of the trunk. The tree has grown reaction wood to compensate for the loss of the wood strength. The risk from the tree is calculated to be acceptable.

Tree # 7

Rainforest sp.

This tree is growing on the creek bank close to the proposed walkway down to the creek. The tree is leaning. The risk from the tree is calculated to be acceptable.

Tree # 8

Rainforest sp.

This is a mature aged tree on the edge of the creek. It has a hollow at the base of the trunk. The tree has grown compensatory reaction wood to compensate for the loss of wood strength. The occupancy rate for the fall zone of the tree is low. The risk from the tree is calculated to be acceptable.

A new toilet block is planned to be constructed on the northern side of the new carpark. There are three (3) tall Gum trees close to this location. The trees are young and were not included in the original survey. If the toilet block is constructed closer than 3 m from the centre of the base of any of these trees that tree is likely to become unviable due to the soil disturbance.

7. Recommendations Day Use Area

It is recommended that tree # 1 be removed before construction commences. It is recommended that the car parking area be constructed so as to retain the fill at least to 3 m from the trunk of tree # 2. If the fill is required to be excavated to 2 m or closer to the tree, the tree should be removed. Tree # 4 should be cut down to a minimum of 2 m high.

Tree # 7 is growing close to the planned track down to the creek. It is recommended that the construction of the track be carried out so that the minimum disturbance occurs the ground. This could be achieved by building steps and paths up instead of excavating. The large native vine at the top of the bank should be retained and protected by minimizing the soil disturbance close to the vine.

The planned track on the northern side of the creek that will run down one of the pools is planned to pass close to some existing trees. It is recommended that the track be constructed to minimize the disturbance of the soil close to the trees.

The Gum tree leaning over the road running down to the day use area is recommended to be removed.

8. Description Camping Area

The site is was previously used as a log dump. There is a large pile of spoil material, possibly from roadside cleanup activities, on the site. The spoil material is clay with rocks and wood debris mixed in. It is not suitable for use as fill material or soil in the camping area. The camping area will include car parking spaces, camping spaces suitable for cars or caravans and some walk in campsites. The construction of the camping area will require the removal of some trees. Trees that are proposed to be retained on the site and that may be impacted by the construction have been identified and described in **Table 3. Camping Area Tree Data** below.

The trees at Unicorn Falls Day Use Area are given in **Table 1. Camping Area Tree Data** below.

Table 3. Camping Area Tree Data.

Tree #	Name	Condition	Height m	DBH mm	Crown m	TPZ m	Comments
1	Ironbark <i>Eucalyptus siderophloia</i>	Good	20	870	15	11.6	Damage to the base of the tree
2	Dead tree	Dead	19	940	1	-	Hollows, orchids
3	Ironbark <i>Eucalyptus siderophloia</i>	Good	18	650	14	7.8	Damage to the base of the tree
4	Tallowood <i>Eucalyptus microcorys</i>	Good	16	600	8	7.2	Damage to the base of the tree
5	Tallowood <i>Eucalyptus microcorys</i>	Fair	12	320	5	3.8	In the walk in camping area. Leaning, decay area at the base of the tree
6	Group of trees in the walk in camping area	Good	15				Dead branches and sticks likely to fail in high winds.

(Brooker and Kleinig 1999).

9. QTRA Risk Assessment Camping Area

Quantified Tree Risk Assessment (QTRA) was used to assess the risk posed by trees. The risk assessment first looks at the target that could be injured or damaged if the tree failed. The size of the part likely to fail is considered and finally the likelihood of the tree (or part of the tree) failing is considered. A probability is assigned to each value and then a probability of risk of harm in the next calendar year is calculated. This can then be compared with benchmark acceptable risk levels and risks from other hazards.

QTRA is a risk assessment process that calculates the risk as a probability and then compares that risk with benchmark figures that are considered to be acceptable. If the risk is assessed as being greater than 1/10,000 it is considered to be unacceptable and action should be taken to lower it. Where the risk is 1/1,000,000 or less it is broadly acceptable and it is considered unreasonable to require action to be taken to lower it even further. Where it between 1/1,000,000 and 1/10,000 it is tolerable. It is considered that any action required to lower it should not be disproportionate to the risk. When a risk is as Low As is Reasonable Practicable (ALARP) it is considered to be acceptable (Ellison 2016).

The results of the risk assessment are reported as a risk index. For example a risk index of 500K is 1/500,000.

The results of the risk assessment are detailed in **Table 2. QTRA Risk Assessment.**

Table 4. QTRA Risk Assessment Camping Area.

Tree #	Name	Comments	Target Range	Size Range	Probability Range	Risk Index	Recommendations
1	Ironbark <i>Eucalyptus siderophloia</i>	Falling branches or dead stick	5	4	2	<1M	No Action
2	Dead tree	Close to planned car parking	3	1	3	40K	Install restraining rope
3	Ironbark <i>Eucalyptus siderophloia</i>	Large tree in good condition apart from damage to the bark on the lower trunk. Possible dead stick drop	3	4	2	500K	Prune dead wood
4	Tallowood <i>Eucalyptus microcorys</i>	Damage to the bark on the lower trunk. Possible dead stick drop	3	4	3	500K	Prune dead wood
5	Tallowood <i>Eucalyptus microcorys</i>	Leaning tree with damage to the base	3	2	3	100K	Remove tree
6	Group of trees near walk in camping area	Possible falling branches in high winds	3	2	3	100K	Close grounds in high winds.

Headings and Abbreviations

Tree #:	Unique tree identification number.
Name:	Common name and species.
Target Range:	Highest value target that the most significant part likely to fail could strike. Ranges 1-6. 1= high, 6=low occupancy.
Size Range:	Size of the part likely to impact the target. 1-4. 1 = large, 4 = small.
Probability Range:	Probability of failure within 12 months. Ranges 2 - 6. 2 = high, 6 = low.
Risk Index	e.g. Risk index 20K = risk of significant harm = 1/20,000.

The risk from each tree was calculated to be the risk from that type of failure considered to be the most likely.

10. Appraisal Camping Area

Tree # 1

Ironbark *Eucalyptus siderophloia*.

This is a mature aged tree near the entrance to the camping area. The risk from the tree is calculated to be acceptable.

Tree # 2

Dead tree stump. This is a large dead tree stump. The trunk of the tree is hollow and there are many additional hollows up the trunk. An orchid is growing at the top of the tree. If it failed it could reach the car parking area. It is considered to have a high ecological significance. The risk from the tree is calculated to be at the high end of the tolerable range.

Tree # 3

Ironbark *Eucalyptus siderophloia*

This tree is close to the edge of the planned car parking area. It may be possible to retain the tree. It has had injuries to the lower trunk and bark has been lost. The underlying wood is sound and there is signs of woundwood forming. The pile of spoil material is currently being stored at the base of this tree. The risk from this tree is calculated to be at the low end of the tolerable range.

Tree # 4

Tallowood tree *Eucalyptus microcorys*.

This tree is close to tree # 3 and is also affected by loss of bark on the lower trunk and the storage of spoil material at the base of the tree. The risk from the tree is calculated to be on the lower end of the tolerable range.

Tree # 5.

Rainforest sp.

This tree is a mature aged and in good condition. The tree is leaning. The risk from the tree is calculated to be acceptable.

Tree # 6

Tallowood *Eucalyptus microcorys*.

This is a small tree in the planned walk in camping area. It has been suppressed by the larger surrounding trees. It is leaning and has a decay area at the base of the tree. The risk from the tree is in the tolerable range. It is likely that the risk from the tree will increase over time as the tree is suppressed by the other trees and will decline in condition.

Tree # 7

Group of Gum trees in the walk in camping area. These trees are generally in good condition. The tree are likely to drop branches or dead stick in high winds. The risk from the trees is in the tolerable range.

11. Recommendations Camping Area

Tree # 2 is dead but it provides a significant habitat and is considered to be important in the environment. The risk from the tree is that it could fall onto the planned car parking area. It is recommended that a restraining rope system be installed from the tree and attaching to one of the adjoining trees so that if it fails the rope will prevent it falling onto the car parking area. It is recommended that the Project Arborist who should be an Arborist qualified to a minimum of AQF 5 in Arboriculture and experienced with installing tree bracing systems be consulted on the installation of the system.

It is recommended that the spoil material be removed from the base of trees # 3 and 4. If they are retained in the camping area they should be pruned to remove the dead branches in the crown that are larger than 50 mm in diameter. The pruning must be carried out by an Arborist qualified to a minimum of AQF 3 in Arboriculture and in accordance with the Australian Standard AS 4373-2007 *Pruning of amenity trees*.

It is recommended that tree # 5 be removed before construction commences.

Most tree failure occurs in high winds. In many circumstances people choose not to be outside and near trees in high winds. Experience shows that this is not always the case with people camping in tents and caravans. The death rate for people in camping situations is known to be disproportionately high. It would be unreasonable to pruned or remove trees to decrease the risk from the trees. In fact it has recently been shown that pruning lower branches from large Gum trees may actually increase the likelihood of failure of the remaining crown due to the sudden change in wind dynamics and the effect of mass dampening (James and Haritos 2014).

It is recommended that the use of the Camping Area be suspended during periods where winds are above 60 km per hour.

12. Disclaimer

The information contained in the report is true and accurate to the best knowledge of the author. Best professional judgement was used to make recommendations. However the author of this report is not responsible for any action which might be taken or not taken in reliance on it.

This report remains the property of the author and National Parks and Wildlife. It may not be used or reprinted without their express permission.

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14. About the Author

This report was compiled by Peter Gray, of Northern Tree Care. The author is an arborist who has been providing Arborist Assessment Reports for Local Government, State Government and private clients for over 15 years. His qualifications include:

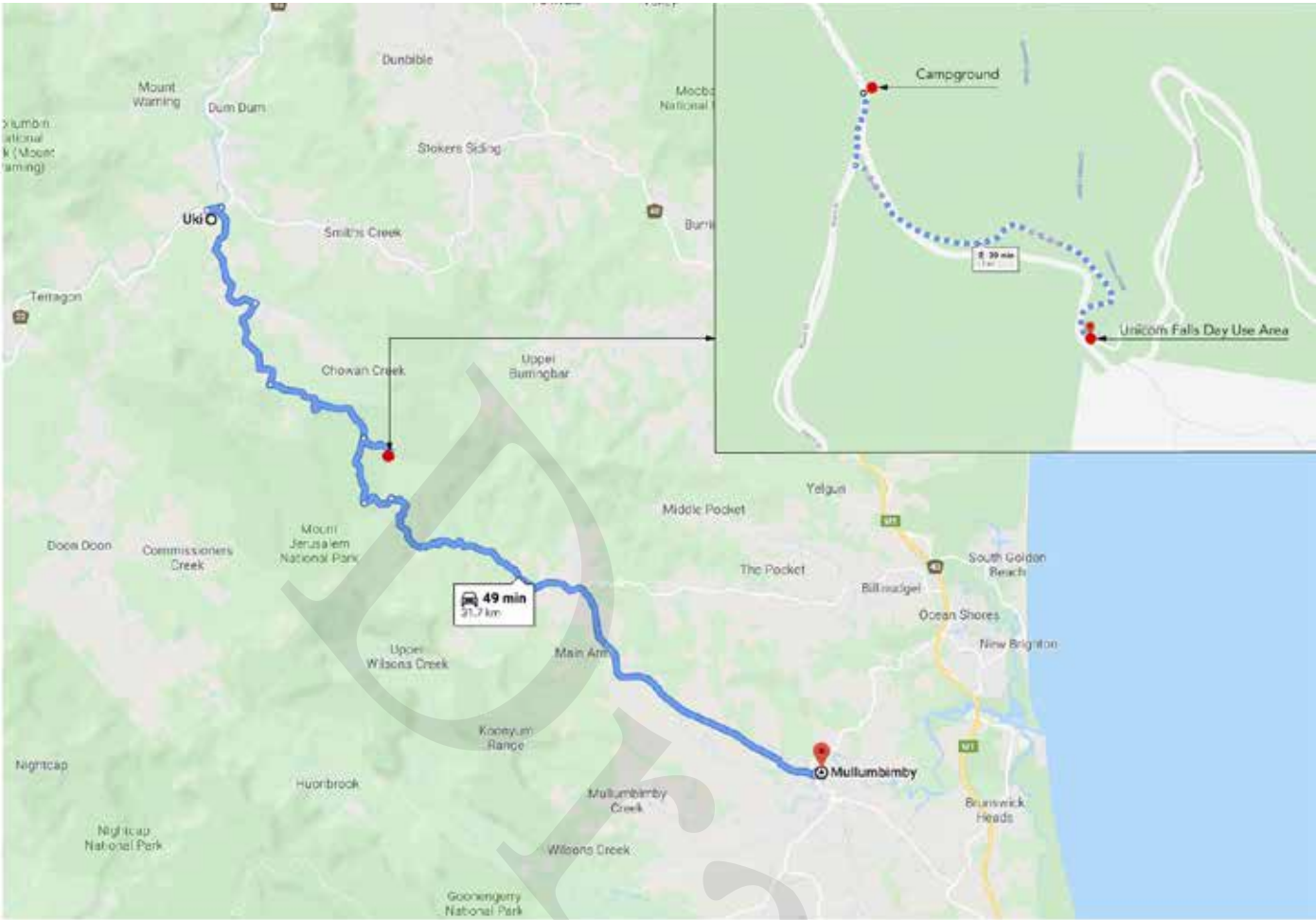
- Graduate Certificate of Arboriculture (AQF 8)
- Diploma of Arboriculture (AQF level 5)
- Diploma of Horticulture (Arboriculture)
- Quantified Tree Risk Assessment (QTRA)
- VALID Tree Risk-Benefit Management Validator

He is a registered general member of Arboriculture Australia No. 2344, trained and registered practitioner of Quantified Tree Risk Assessment (QTRA) Registered User number 980 and a registered member of VALID Tree Risk-Benefit Management..

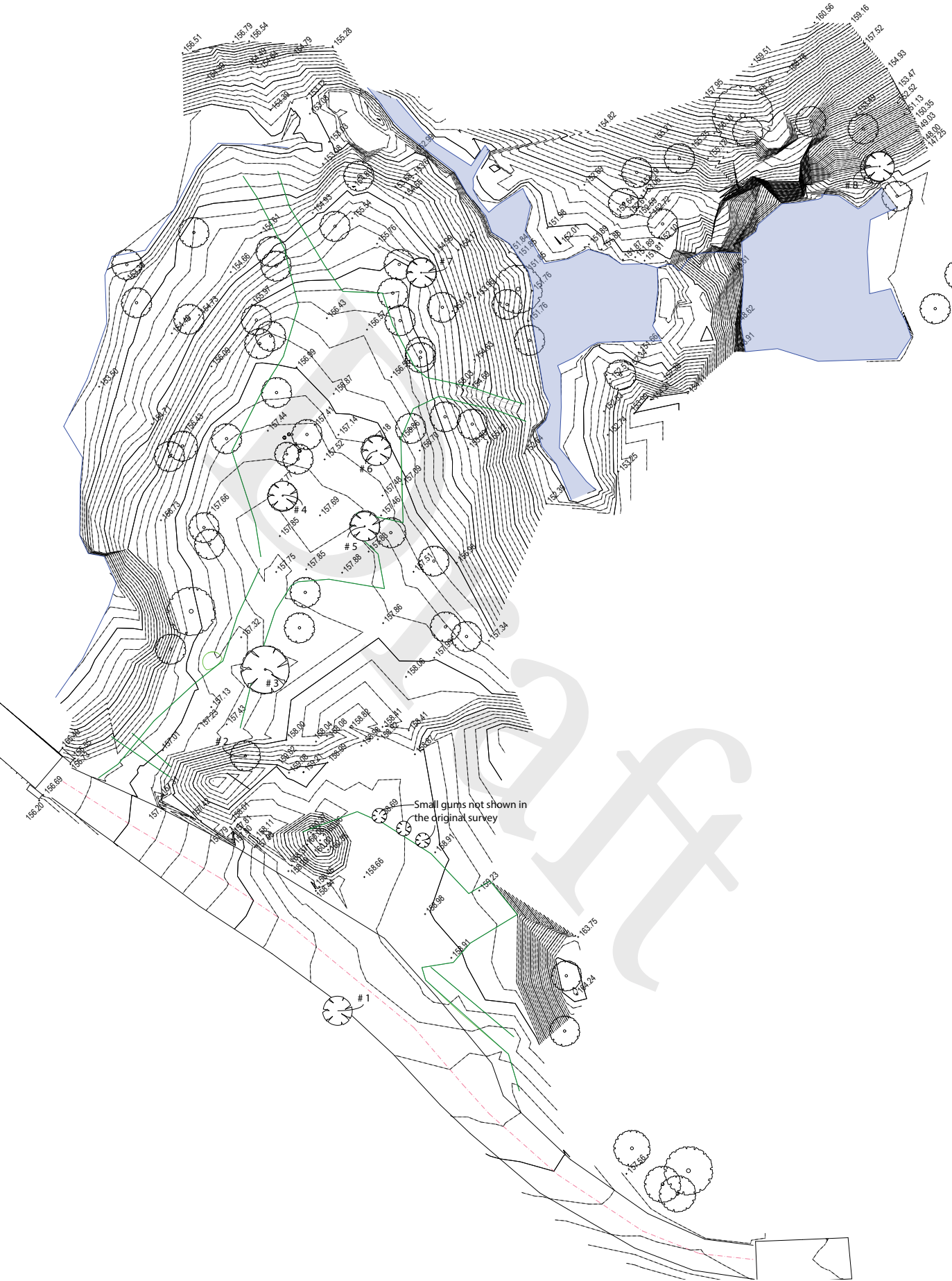
I declare that I have compiled this report impartially using best professional judgement. I have no financial interest in the outcome of the report.

Signed Peter Gray, Northern Tree Care
20th December, 2019.

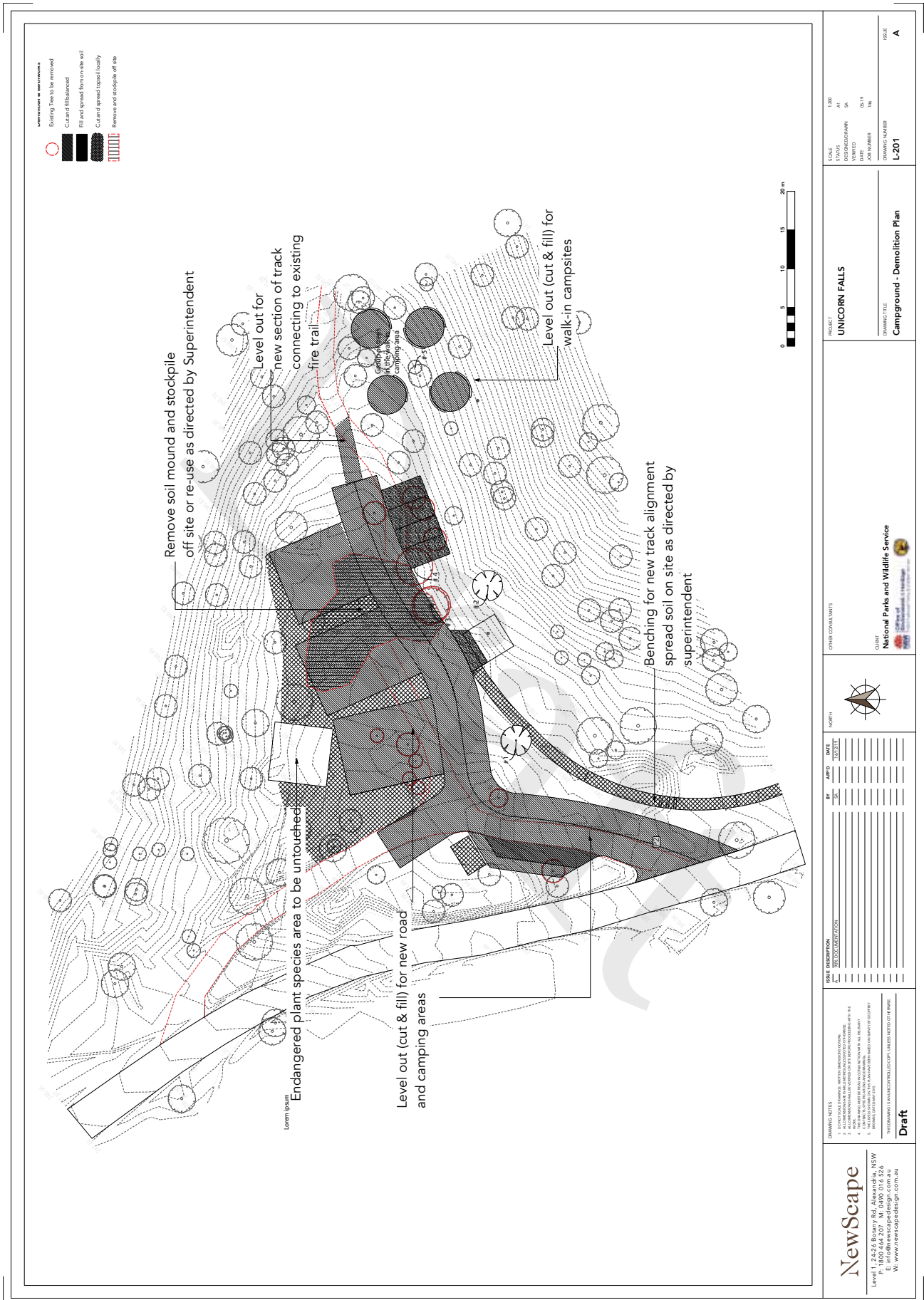
15. Attachment 1. Location Map.



17. Attachment 3. Day Use Area Detail



18. Attachment 4. Camping Area Survey Detail.



- REMOVAL OF VEGETATION**
- Existing trees to be removed
 - Cut and fibulenced
 - Fill and spread form on site soil
 - Cut and spread topsoil locally
 - Remove and stockpile off site



<p>PROJECT UNICORN FALLS</p> <p>CLIENT National Parks and Wildlife Service</p>	<p>SCALE 1:200</p> <p>DESIGNER AT</p> <p>DATE 08/19</p> <p>CONTRACT T&E</p> <p>DRAWING NUMBER L-201</p>	<p>OTHER CONSULTANTS</p> <p>CLIENT National Parks and Wildlife Service</p>	<p>DATE 12/2019</p> <p>BY [Signature]</p> <p>FOR [Signature]</p>	<p>DATE 12/2019</p> <p>BY [Signature]</p> <p>FOR [Signature]</p>	<p>PROJECT UNICORN FALLS</p> <p>CLIENT National Parks and Wildlife Service</p> <p>DRAWING TITLE Campground - Demolition Plan</p> <p>SCALE A</p>
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19. Attachment 5. Photos



Photo 1
Day Use Area Tree # 2
Rose Walnut



Photo 2
Day Use Area Tree # 4
Dead tree



Photo 3
Day Use Area Tree # 6
Tree has a hollow at the base



Photo 4
Day Use Area Tree # 7
A path is planned to run beside this tree



Photo 5
Day Use Area Tree # 8
Hollow at the base



Photo 6
Road into Day Use Area
Leaning Tree



Photo 7
Camping Area Tree # 1
Ironbark



Photo 8
Camping Area Tree # 3
Ironbark



Photo 9
Camping Area Tree # 4
Tallowood



Photo 10
Camping Area Tree # 5
Tallowood



Photo 7
Camping Area Tree # 3
Dead branches in the crown.