TREE SURVEY

ARBORICULTURAL IMPACT ASSESSMENT & TREE PROTECTION PLAN

Homebush Intersection Upgrade
Homebush Bay Drive, Australia Avenue and Underwood Road, Homebush
Version 1

Prepared for:
Fulton Hogan

17 September 2024

Document information

Title:	Homebush Intersection Upgrade
Report type:	Arboricultural Impact Assessment (AIA) & Tree Protection Plan (TPP)
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Document status

Document status	Date	Revision description
Version 1	17/09/24	Final version

Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
DBH	Diameter at Breast Height
Id	Identification
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
sp.	Species
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

Contents

1 Background

1.1 Introduction

Tree Survey was commissioned by Fulton Hogan to prepare an Arboricultural Impact Assessment (AIA) and Tree Protection Plan (TPP) for a proposed intersection upgrade at the junction of Homebush Bay Drive, Australia Avenue, and Underwood Road, Homebush.

The purpose of this report is to:

- Assess all trees within and adjacent to the development footprint.
- Evaluate the impacts of the proposed works and assess suitability for tree retention.
- Identify trees that require removal and specify protection for trees that will be retained.

1.2 The proposal

The key features of the proposal are summarised as follows:

- Proposed traffic signal and service upgrade.
- Associated civil works.

1.3 Documents and plans referenced

The conclusions and recommendations of this report are based on the Australian Standard, AS 4970-2009, Protection of Trees on Development Sites (AS4970), the findings from the site inspections, and analysis of the documents/plans listed in **Table 1**.

Table 1: Documents and plans

Document	Author	Version	Date
Engineering Plans	Provided as DWG file	-	-
Detail Survey	Provided as DWG file	-	-
Biodiversity Management Guideline	TfNSW	2.0	2024
Tree and Hollow Replacement Guidelines	TfNSW	1.1	2023

The survey and engineering plans have been used as map layers in the Arboricultural Impact Assessment Drawings and Tree Protection Plan Drawings.

1.4 Definition of a tree

The Transport for NSW Biodiversity Management Guideline (2024) defines a tree as a long-lived perennial plant greater than 3m in height with one or relatively few main stems or trunks. Trees that do not meet the prescribed dimensions have generally not been included in this report.

2 Method

2.1 Visual Tree Assessment (VTA)

The subject trees were assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994) and practices consistent with modern arboriculture.

The following limitations apply to this methodology:

- Trees are inspected visually from ground level without the use of any invasive or diagnostic tools and testing.
- Trees within private properties or restricted areas were not subject to a complete visual inspection (i.e., defects and abnormalities may be present but not recorded).
- Diameter at breast height (DBH) has been accurately measured using a diameter tape (where access to the trees was available).
- Tree height and canopy spread are estimated unless otherwise stated.
- Tree protection zones have been calculated in accordance with AS4970 using the DBH and diameter at root buttress (DRB) measurements.
- Tree identification is based on broad taxonomical features present and visible from ground level at the time of inspection.

2.2 Significance of a Tree, Assessment Rating System (STARS).

The retention value of a tree or group of trees is determined using a combination of environmental, cultural, physical, and social values.

- **Low:** These trees are not considered important for retention, nor require special works or design modifications to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works.
- **High:** These trees are considered important for retention and should be considered for retention where possible. Design modification or relocation of building/s should be considered to accommodate the setbacks as prescribed by AS4970.

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Aboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS). The system uses a scale of High, Medium, and Low significance in the landscape. Once the landscape significance of a tree has been defined, the retention value can be determined. Each tree must meet a minimum of three (3) assessment criteria to be classified within a category. Further details and the assessment criteria are in the **Appendices.**

3 Arboricultural Impact Assessment (AIA)

3.1 The impact footprint

Assessment of tree impacts requires a clear understanding and distinction between the construction footprint (or project footprint) and the impact footprint.

- **The construction footprint:** The construction footprint is commonly understood as the extent of the proposal, project area, or subject site. The construction footprint is typically defined by the project boundary or limit of works.
- **The impact footprint:** The impact footprint is located within the construction footprint but should only include elements of the proposal (areas of work) that are likely to impact trees.

It is important to identify elements of the proposal (areas of the construction footprint) that will impact trees and exclude elements of the proposal (areas of the construction footprint) that will not impact trees. The table below provides examples of common construction items that should be included in the impact footprint and excluded from the impact footprint.

Table 2: The impact footprint

Item	Included in the impact footprint	Excluded from the impact footprint
Excavation	Excavation greater than 150mm	Excavation less than 150mm.
Fill	Fill greater than 150mm	Fill less than 150mm.
Grading	Changes in soil level greater than 150mm	Changes in soil level less than 150mm
Hardstand	Impervious concrete or asphalt hardstand	Permeable hardstand with <150mm excavation
Services	Services installed with open-cut trenching	Services installed using directional drilling
Driveways	Impervious driveway with >150mm excavation	Permeable driveway with <150mm excavation
Pathways	Impervious pathway with >150mm excavation	Pathway with <150mm excavation
Building	Building or structure at existing grade	Suspended building with drainage to soil
Decks	Impervious deck at or above grade	Suspended deck with drainage to soil

Once the impact footprint is identified, it is compared with the existing trees and tree protection zones. The impact footprint is used to calculate impacts on trees and informs which trees can be retained, and which trees need to be removed.

3.2 Tree protection zones

The Australian Standard, Protection of Trees on Development Sites (AS4970), describes two zones that need to be considered when undertaking an arboricultural impact assessment:

- **Tree protection zone (TPZ):** The TPZ is the combination of crown and root area that requires protection during the construction process so that the tree can remain viable. The TPZ is calculated by measuring the DBH and multiplying it by twelve (12). The resulting value is applied as a radial measurement from the centre of the trunk to delineate the TPZ.
- **Structural root zone (SRZ):** The SRZ is the area of the root system used for stability, mechanical support, and anchorage of the tree.

Encroachment within the TPZ is acceptable, providing that the arborist can demonstrate that the tree will remain viable. There are three (3) levels of encroachment defined by AS4970.

Table 3: Levels of encroachment

Nil encroachment (0%)	Nil encroachment within the TPZ.
Minor encroachment (<10%)	The encroachment is less than 10% of the TPZ.
Major encroachment (>10%)	The encroachment is greater than 10% of the TPZ.

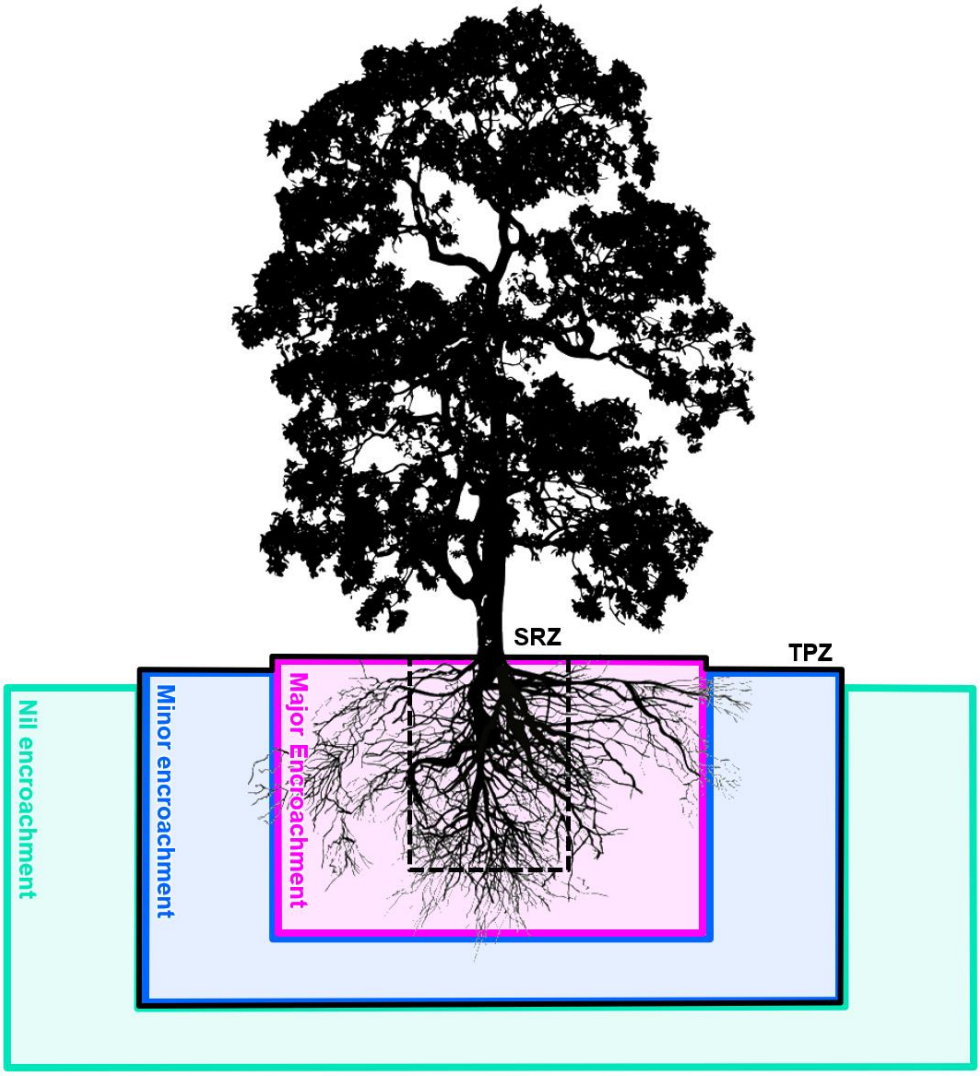


Figure 1: Three (3) levels of encroachment

4 Results

A total of **72** trees were assessed and included in this report. The results are as follows:

4.1 Encroachment within the TPZ

A summary of trees impacted by the proposed construction footprint is outlined below.

Table 4: Encroachment summary

Nil encroachment (0%)	A total of **58** trees will be subject to nil encroachment.
Minor encroachment (<10%)	A total of **14** trees will be subject to major encroachment.
Major encroachment (>10%)	A total of **0** trees will be subject to major encroachment.

4.2 Tree removal and retention

A summary of proposed tree removal and retention is outlined below.

Table 5: Tree removal summary

Retain	A total of **72** trees are proposed for retention.
Remove	A total of **0** trees are proposed for removal.

Table 6: Tree data

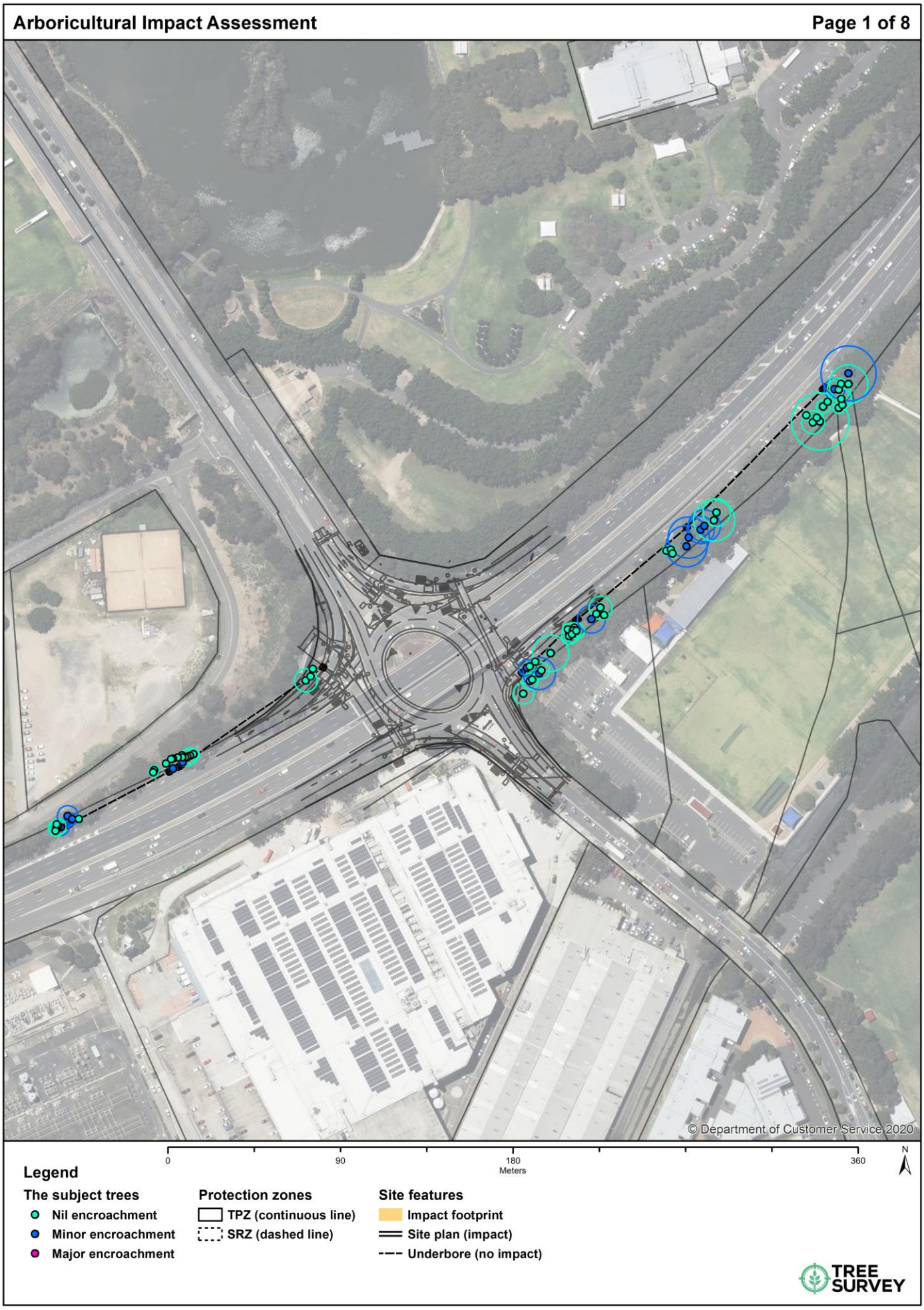
Id.	Botanical name	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment	% Encroachment within TPZ	Other notes	Proposal
1	*Ficus benjamina*	16	12	Good	Good	Mature	High	Medium	High	1200	-	-	1200	1250	14.4	3.6	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
2	*Olea europaea*	7	3	Good	Good	Mature	Low	Medium	Low	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
3	*Ficus benjamina*	16	16	Good	Good	Mature	High	Medium	High	500	500	450	840	2000	10.1	4.4	Nil	0%	-	Retain
4	*Ficus microcarpa*	20	16	Good	Good	Mature	High	Medium	High	450	-	-	450	500	5.4	2.5	Minor	2%	Tree will be subject to a minor encroachment within the TPZ	Retain
5	*Ficus benjamina*	12	12	Good	Good	Mature	Medium	Medium	Medium	500	-	-	500	550	6.0	2.6	Nil	0%	-	Retain
6	*Ficus benjamina*	12	10	Good	Good	Mature	Medium	Medium	Medium	450	-	-	450	500	5.4	2.5	Nil	0%	-	Retain
7	*Celtis australis*	6	4	Good	Good	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
8	*Celtis australis*	8	2	Good	Good	Mature	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
9	*Ficus benjamina*	10	6	Good	Good	Mature	Medium	Medium	Medium	300	-	-	300	650	3.6	2.8	Nil	0%	-	Retain
10	*Celtis australis*	10	8	Good	Good	Mature	Low	Medium	Low	250	-	-	250	300	3.0	2.0	Nil	0%	-	Retain
11	*Celtis australis*	8	3	Good	Good	Mature	Low	Medium	Low	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
12	*Tristaniopsis laurina*	8	2	Fair	Fair	Mature	Low	Medium	Low	150	100	-	180	230	2.2	1.8	Nil	0%	50% of the tree is dead.	Retain
13	*Ficus benjamina*	16	16	Good	Good	Mature	High	Medium	High	1300	-	-	1300	1350	15.0	3.8	Nil	0%	-	Retain
14	*Ficus benjamina*	12	12	Good	Good	Mature	High	Medium	High	500	-	-	500	550	6.0	2.6	Nil	0%	-	Retain
15	*Ficus benjamina*	14	12	Good	Good	Mature	High	Medium	High	600	-	-	600	650	7.2	2.8	Nil	0%	-	Retain
16	*Ficus benjamina*	16	12	Good	Good	Mature	High	Medium	High	900	-	-	900	950	10.8	3.2	Nil	0%	-	Retain
17	*Ficus benjamina*	16	12	Good	Good	Mature	High	Medium	High	450	350	400	700	1200	8.4	3.6	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
18	*Ficus benjamina*	14	12	Good	Good	Mature	High	Medium	High	600	-	-	600	650	7.2	2.8	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
19	*Ficus benjamina*	16	10	Good	Good	Mature	High	Medium	High	900	-	-	900	950	10.8	3.2	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
20	*Ficus benjamina*	16	16	Good	Good	Mature	High	Medium	High	900	-	-	900	950	10.8	3.2	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
21	*Casuarina glauca*	10	2	Good	Good	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
22	*Casuarina glauca*	10	4	Good	Good	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
23	*Celtis australis*	6	5	Good	Good	Mature	Low	Medium	Low	100	150	-	180	230	2.2	1.8	Nil	0%	-	Retain
24	*Ficus benjamina*	12	10	Good	Good	Mature	Medium	Medium	Medium	500	-	-	500	550	6.0	2.6	Nil	0%	-	Retain
25	*Celtis australis*	6	4	Good	Good	Mature	Low	Medium	Low	100	150	-	180	230	2.2	1.8	Nil	0%	-	Retain
26	*Celtis australis*	8	6	Good	Good	Mature	Low	Medium	Low	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
27	*Ficus benjamina*	12	16	Good	Good	Mature	Medium	Medium	Medium	350	350	350	610	660	7.3	2.8	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
28	*Olea europaea*	6	5	Good	Good	Mature	Low	Medium	Low	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
29	*Corymbia maculata*	12	5	Good	Good	Mature	Medium	Medium	Medium	250	-	-	250	300	3.0	2.0	Nil	0%	-	Retain
30	*Corymbia maculata*	8	1	Good	Good	Mature	Medium	Medium	Medium	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
31	*Corymbia maculata*	10	5	Good	Good	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
32	*Corymbia maculata*	12	6	Good	Good	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
33	*Ficus benjamina*	10	10	Good	Good	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
34	*Corymbia maculata*	10	2	Good	Good	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
35	*Corymbia maculata*	14	10	Good	Good	Mature	High	Medium	High	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
36	*Corymbia maculata*	8	1	Good	Good	Mature	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain

Id.	Botanical name	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment	% Encroachment within TPZ	Other notes	Proposal
37	*Corymbia citriodora*	14	8	Good	Good	Mature	High	Medium	High	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
38	*Ficus benjamina*	12	16	Good	Good	Mature	Medium	Medium	Medium	350	450	550	790	840	9.5	3.1	Nil	0%	-	Retain
39	*Celtis australis*	6	4	Good	Good	Mature	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
40	*Eucalyptus sideroxylon*	6	1	Good	Good	Mature	Low	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
41	*Acacia sp.*	4	1	Poor	Poor	Mature	Low	Short	Low	350	-	-	350	400	4.2	2.3	Minor	3%	Tree has been topped only stump remains. Tree is growing on a lean.	Retain
42	*Eucalyptus sp.*	4	2	Good	Good	Juvenile	Low	Medium	Low	100	-	-	100	150	2.0	1.5	Nil	0%	-	Retain
43	*Eucalyptus sideroxylon*	8	8	Good	Good	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
44	*Eucalyptus scoparia*	14	10	Good	Good	Mature	High	Medium	High	700	-	-	700	750	8.4	2.9	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
45	*Acacia sp.*	4	3	Fair	Fair	Semi-mature	Low	Medium	Low	100	100	100	170	220	2.0	1.8	Nil	0%	-	Retain
46	*Casuarina glauca*	7	4	Good	Good	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
47	*Eucalyptus punctata*	28	9	Good	Good	Mature	Medium	Medium	Medium	500	-	-	500	550	6.0	2.6	Nil	0%	-	Retain
48	*Eucalyptus sideroxylon*	10	10	Good	Good	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
49	*Eucalyptus sp.*	12	6	Good	Good	Mature	Medium	Medium	Medium	450	-	-	450	500	5.4	2.5	Nil	0%	-	Retain
50	*Corymbia maculata*	16	9	Good	Good	Semi-mature	Medium	Medium	Medium	250	-	-	250	300	3.0	2.0	Nil	0%	-	Retain
51	*Corymbia maculata*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
52	*Corymbia maculata*	18	12	Good	Good	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
53	*Corymbia maculata*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
54	*Callistemon citrinus*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
55	*Pittosporum undulatum*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
56	*Corymbia maculata*	18	12	Good	Good	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
57	*Casuarina glauca*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
58	*Callistemon salignus*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
59	*Callistemon salignus*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
60	*Allocasuarina littoralis*	6	3	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Minor	8%	Tree will be subject to a minor encroachment within the TPZ	Retain
61	*Casuarina glauca*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
62	*Allocasuarina littoralis*	4	2	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Minor	1%	Tree will be subject to a minor encroachment within the TPZ	Retain
63	*Eucalyptus sp.*	6	4	Good	Good	Semi-mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
64	*Casuarina glauca*	6	4	Good	Good	Semi-mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	Nil	0%	-	Retain
65	*Eucalyptus crebra*	16	9	Good	Good	Mature	Medium	Medium	Medium	350	300	-	460	510	5.5	2.5	Minor	4%	Tree will be subject to a minor encroachment within the TPZ	Retain
66	*Eucalyptus punctata*	5	3	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain
67	*Eucalyptus piperita*	6	4	Good	Good	Semi-mature	Low	Medium	Low	200	150	-	250	300	3.0	2.0	Minor	3%	Tree will be subject to a minor encroachment within the TPZ	Retain
68	*Eucalyptus crebra*	5	3	Good	Good	Juvenile	Low	Medium	Low	150	100	100	210	260	2.5	1.9	Nil	0%	-	Retain
69	*Eucalyptus punctata*	12	6	Good	Good	Semi-mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
70	*Eucalyptus punctata*	12	6	Good	Good	Semi-mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Minor	3%	Tree will be subject to a minor encroachment within the TPZ	Retain
71	*Eucalyptus punctata*	12	6	Good	Good	Semi-mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	Nil	0%	-	Retain
72	*Eucalyptus crebra*	5	3	Good	Good	Juvenile	Low	Medium	Low	150	-	-	150	200	2.0	1.7	Nil	0%	-	Retain

5 Discussion

Table 7: Discussion of impacts

Nil encroachment (0%) Total trees: **58**	**Retain** A total of **58** trees will be subject to nil encroachment. No impacts on these trees are foreseeable under the current proposal.
	Remove No trees within the category of “nil encroachment” are proposed for removal.
Minor encroachment (<10%) Total trees: **14**	**Retain** A total of **14** trees will be subject to a minor encroachment of less than 10% within the TPZ. The encroachments are highly unlikely to impact the overall health or condition of these trees. Under the current proposal, these trees can be successfully retained.
	Remove No trees within the category of “minor encroachment” are proposed for removal.
Major encroachment (>10%) Total trees: **0**	**Remove** No trees within the category of “major encroachment” are proposed for retention.
	Remove No trees within the category of “major encroachment” are proposed for removal.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The subject trees
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Impact footprint
Site plan (impact)
Underbore (no impact)
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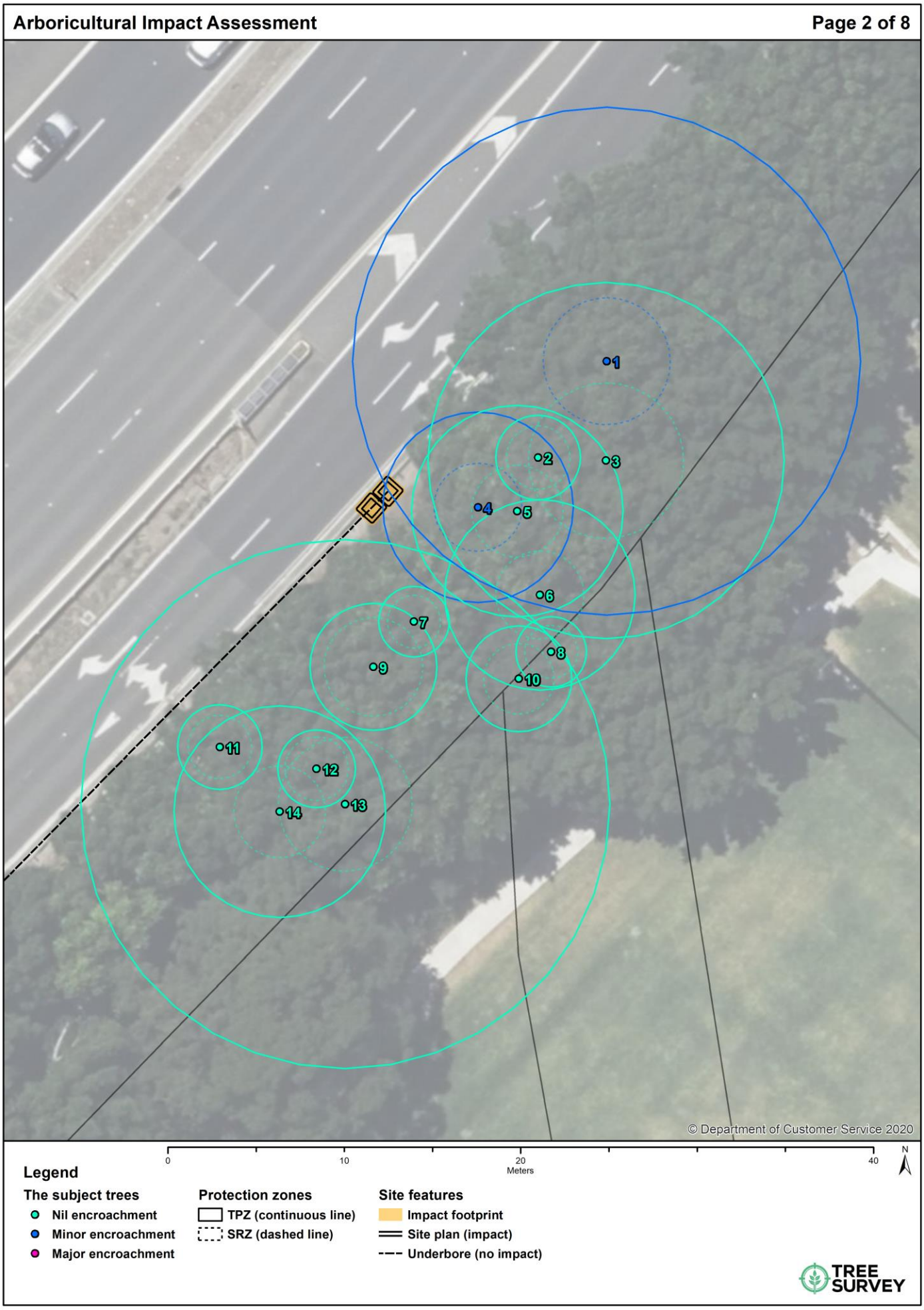
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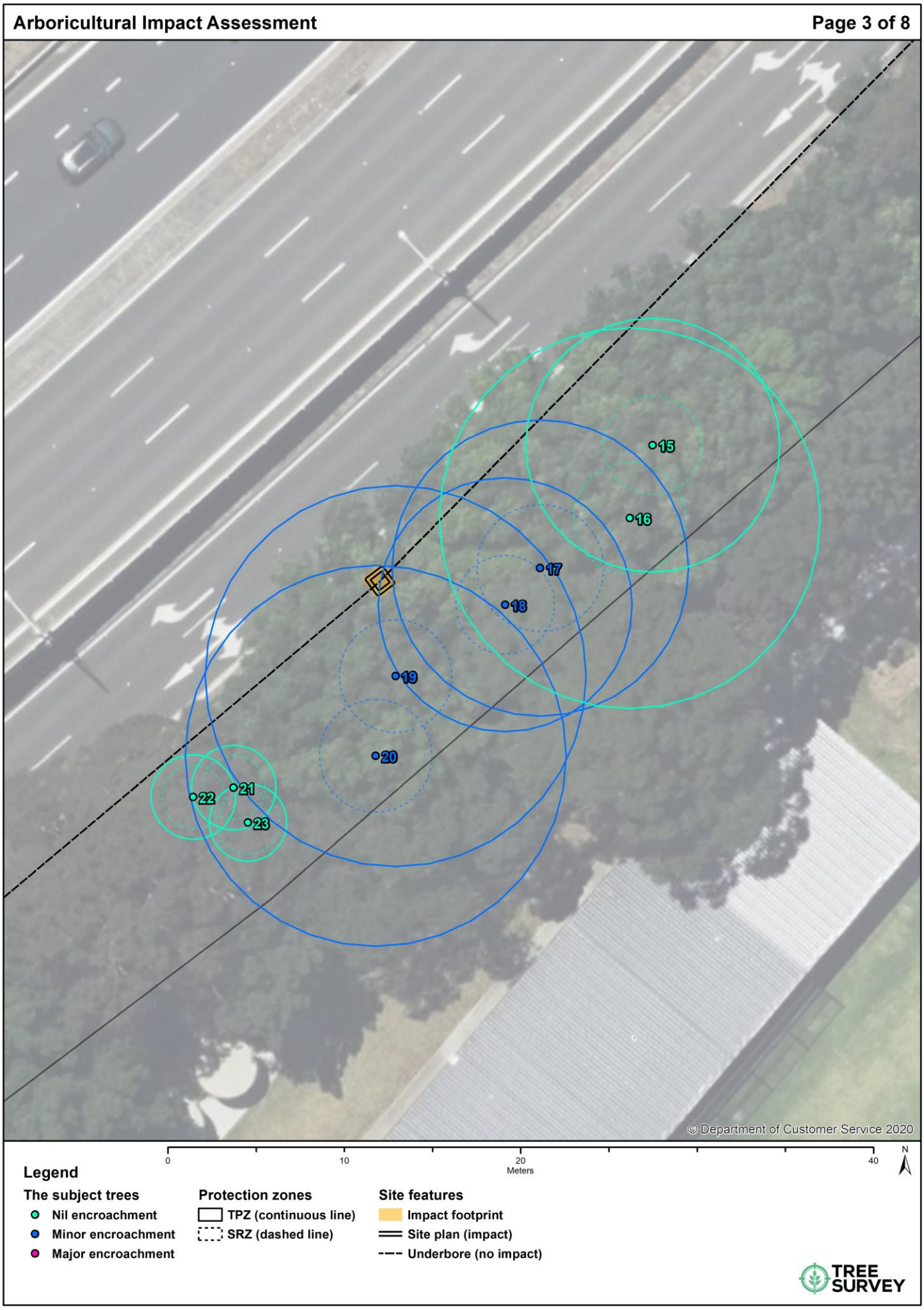
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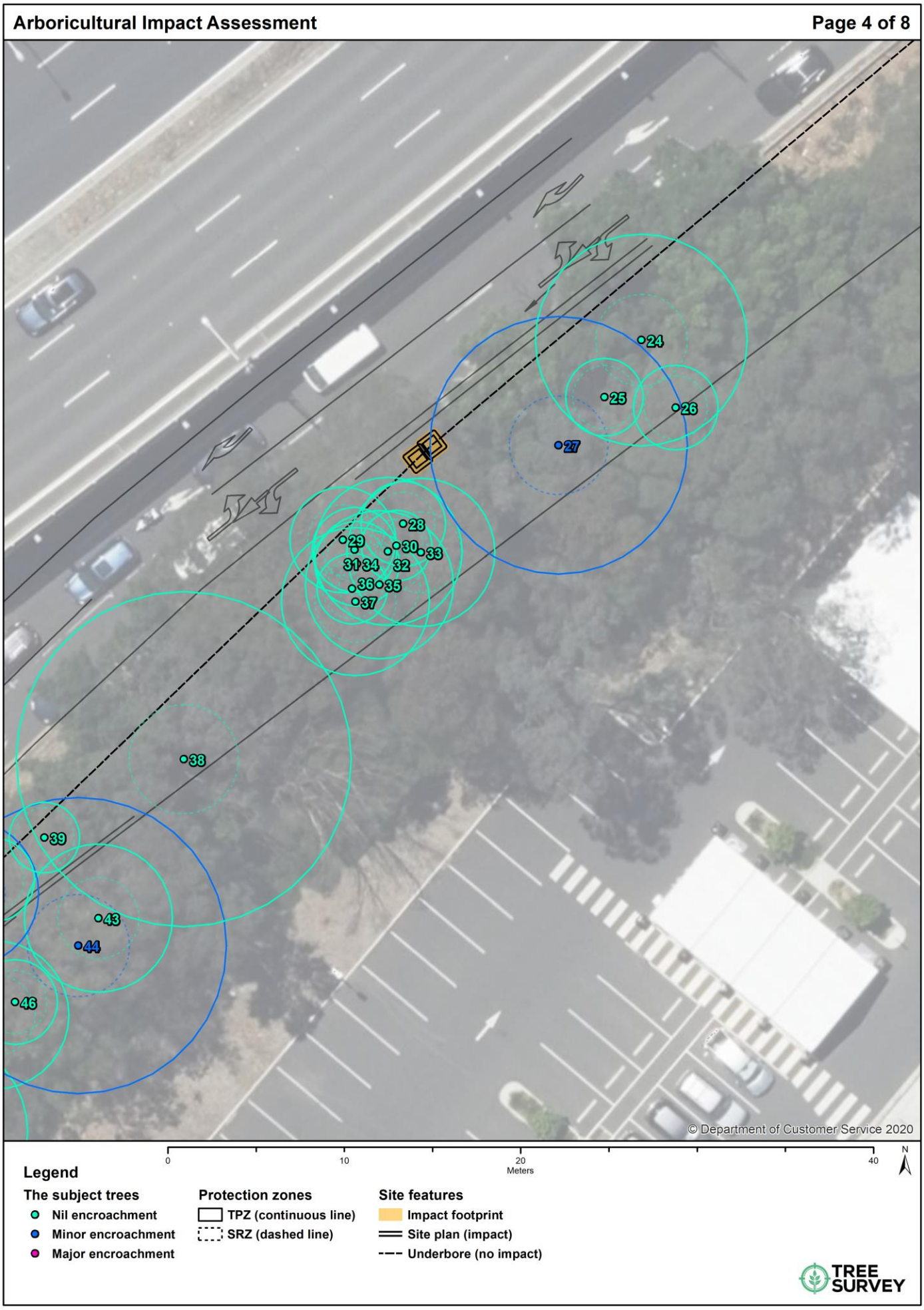
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Protection zones
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SRZ (dashed line)
Site features
Impact footprint
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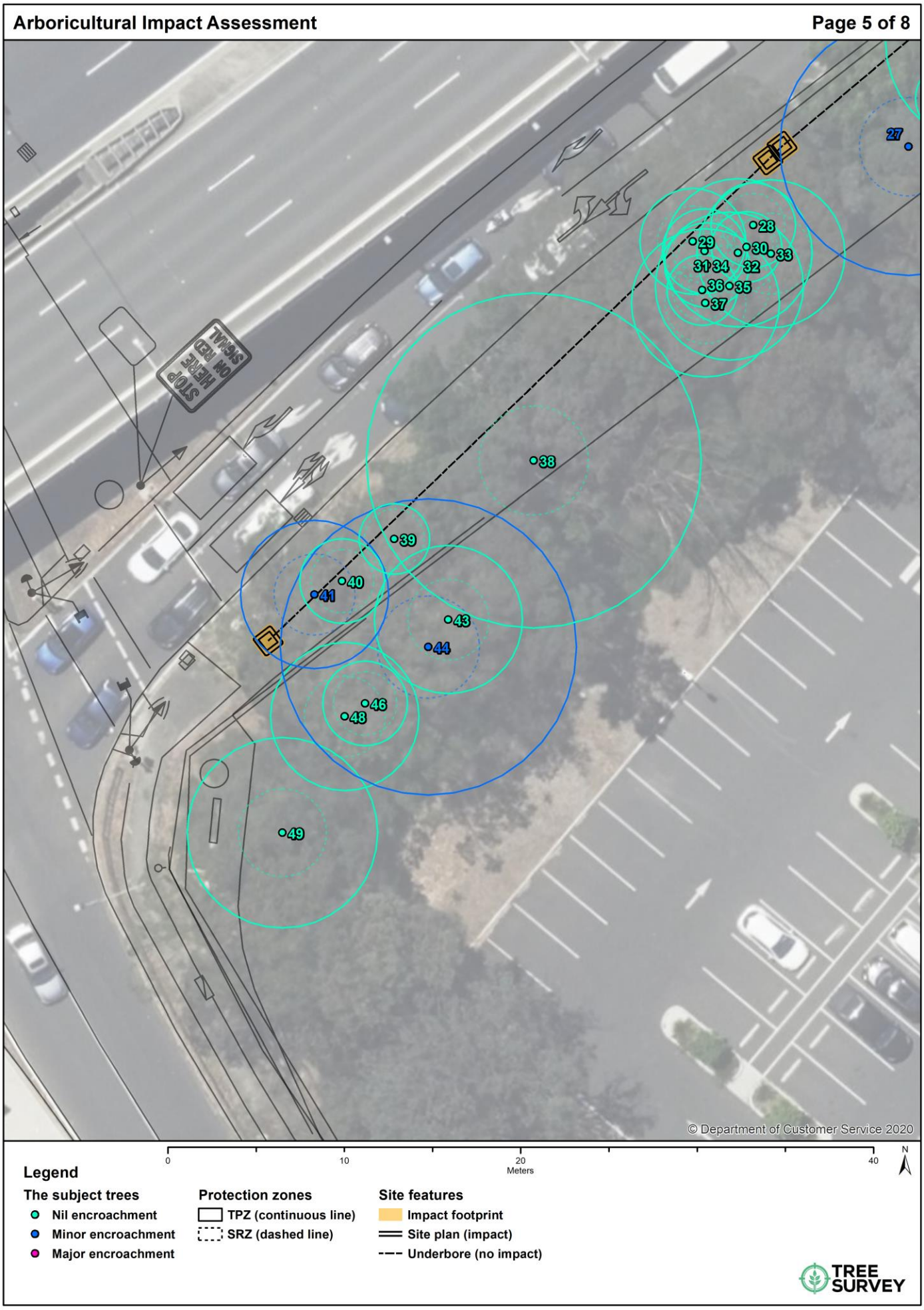
Underbore (no impact)
TREE SURVEY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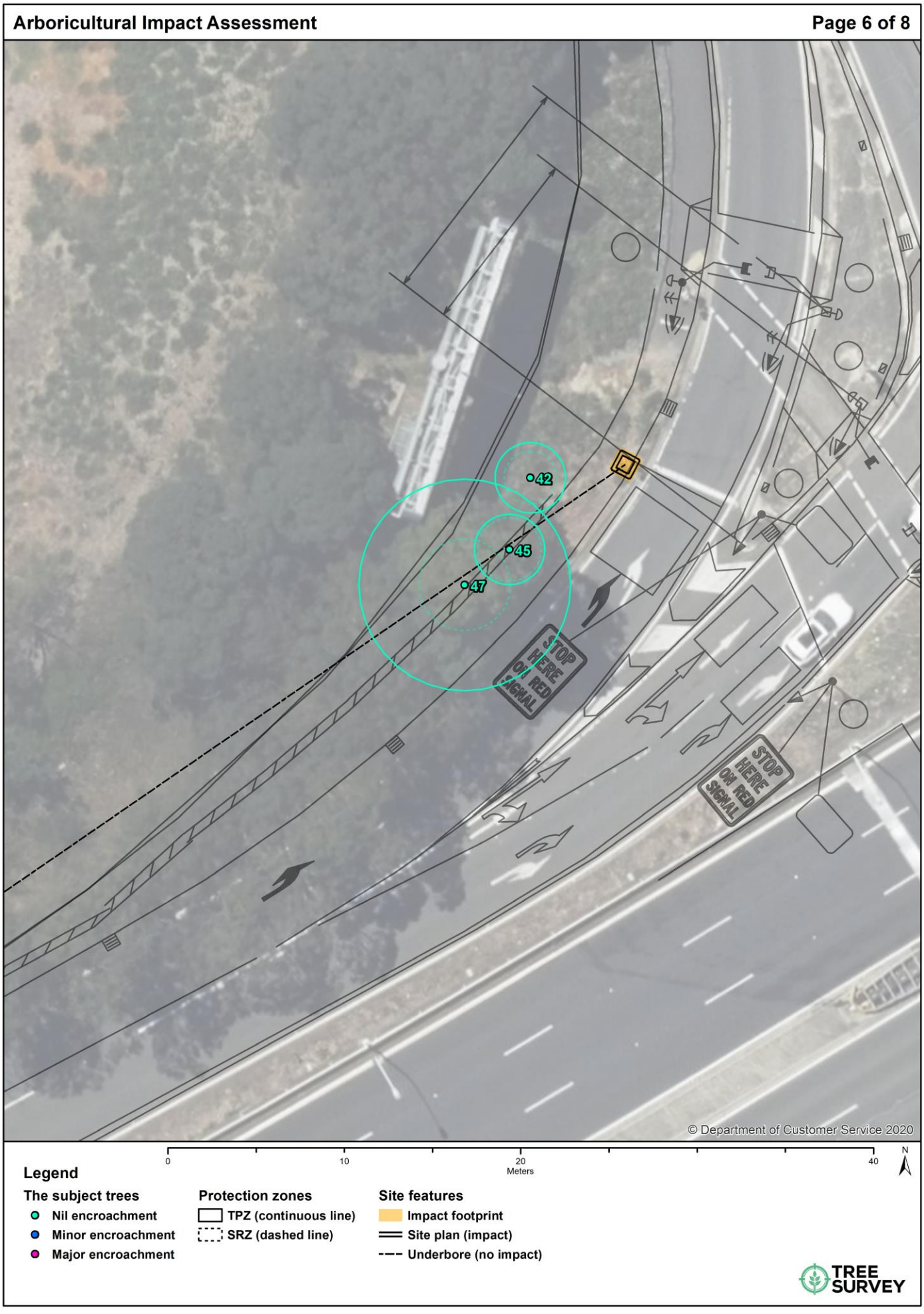
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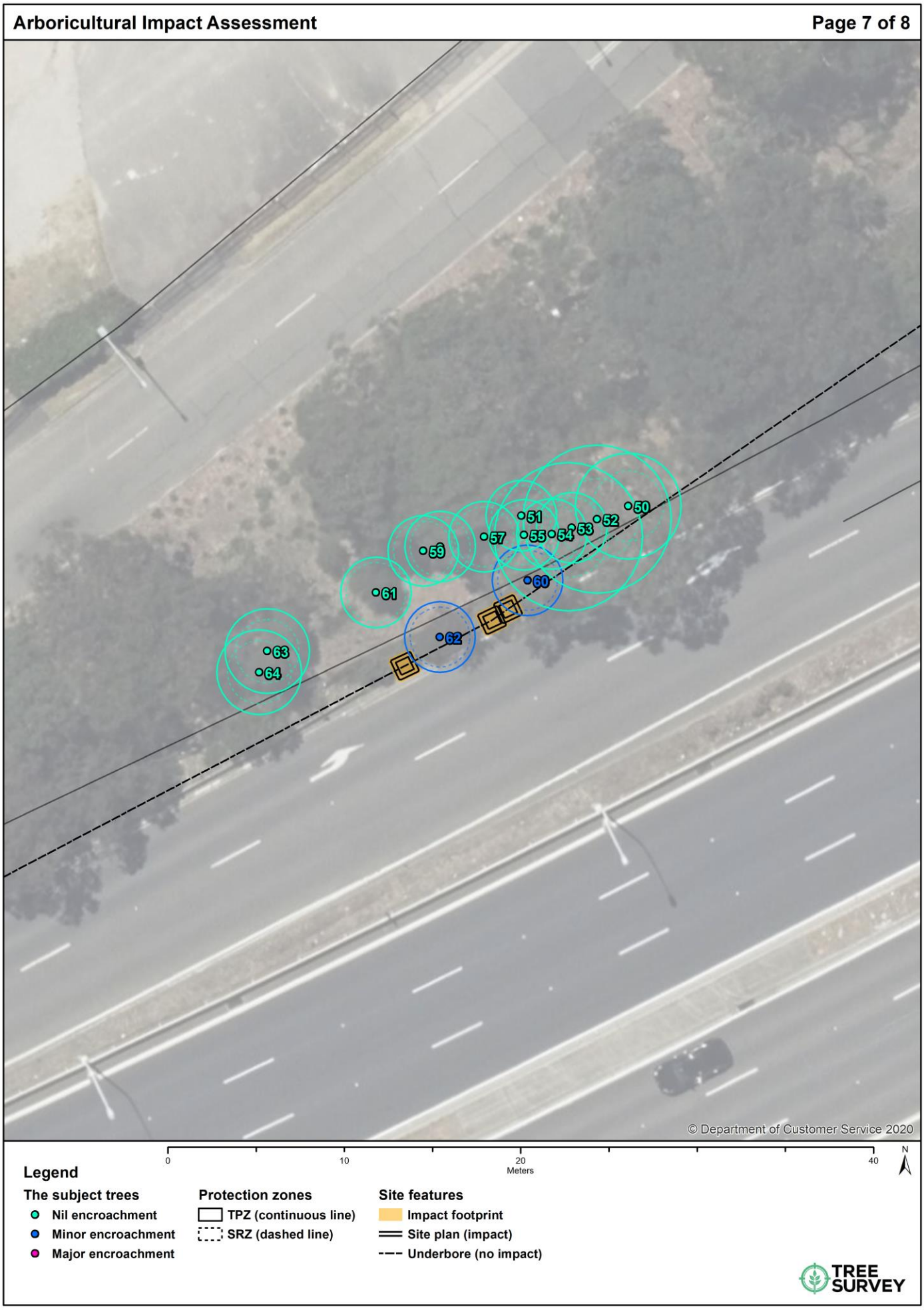
TREE SURVEY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Protection zones
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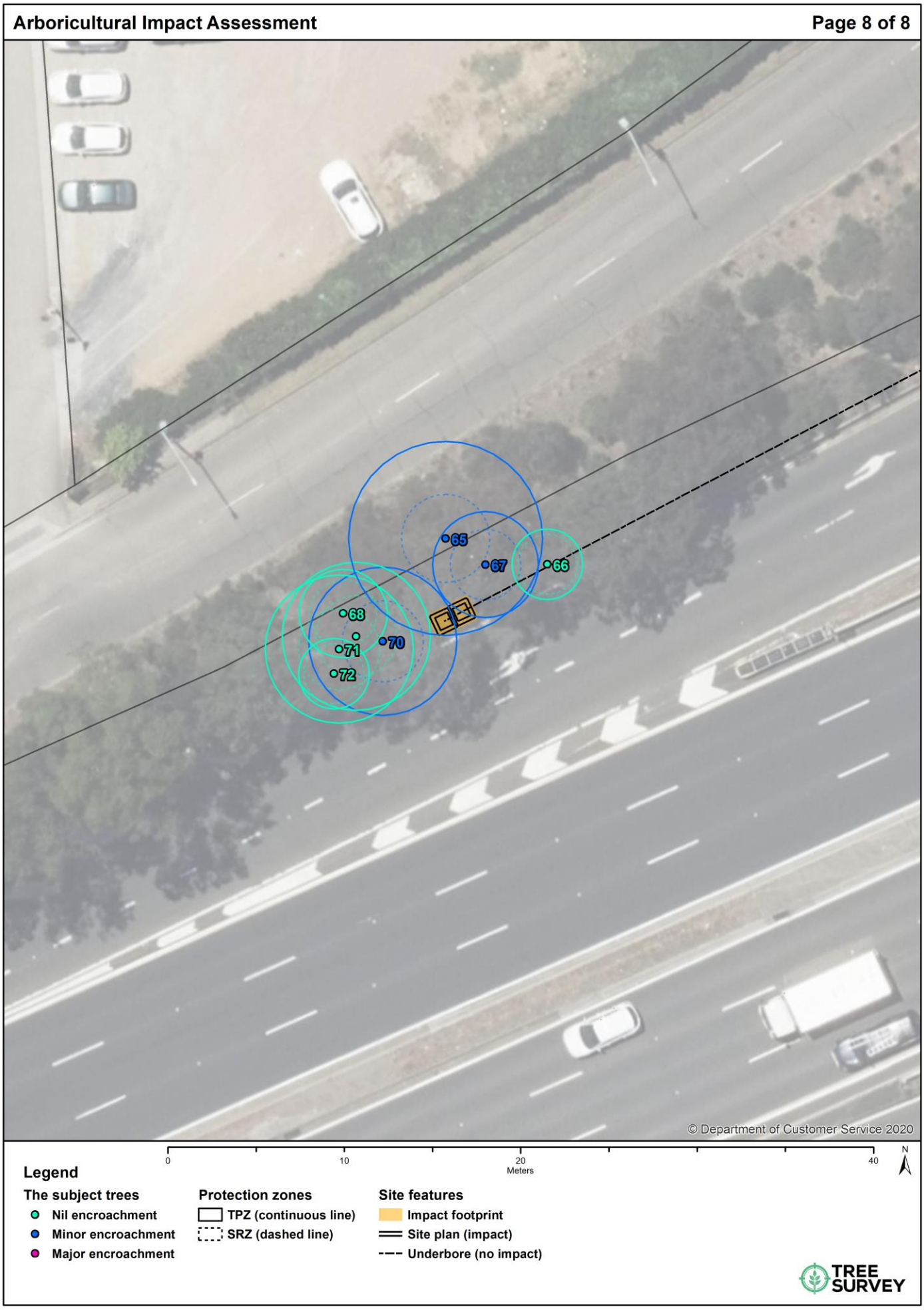
TREE SURVEY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TREE SURVEY

6 Tree Protection Plan (TPP)

6.1 Tree removal and retention

A summary of proposed tree removal and retention is outlined below.

Table 8: Tree removal summary

Retain	A total of **72** trees are proposed for retention.
Remove	A total of **0** trees are proposed for removal.

6.2 Tree pruning

Minor vegetation trimming may be required to accommodate construction clearances. Standard pruning specifications are outlined below:

- Pruning must not exceed 10% of the overall canopy volume.
- No limbs greater than 150mm in diameter are to be removed.
- Any tree pruning must be in accordance with Australian Standard AS4373-2007, Pruning of Amenity Trees (AS4373).

If the proposed vegetation trimming does not meet the specifications outlined above, the project arborist must undertake an assessment of impacts on a case-by-case basis.

6.3 Tree protection fencing

Tree protection fencing must be established at the locations shown in the TPP. Existing fencing, site hoarding, or structures (such as a wall or building) may be used as tree protection fencing, providing the TPZ remains isolated from the construction footprint. Tree protection fencing must be installed prior to site establishment and remain intact until the completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist. Specifications for the tree protection fencing are as follows:

- Temporary mesh panel fencing (minimum height of 1.8m).
- Installed prior to site establishment and remain intact until the completion of works.
- Protective fencing must not be removed or altered without the approval of the project arborist.
- Prominently signposted with 300mm x 450mm boards stating, “NO ACCESS - TREE PROTECTION ZONE.”
- Certified and inspected by the project arborist.

If tree protection fencing is not practical due to site constraints, tree protection delineation must be installed as an alternative. Specifications for tree protection barriers are as follows:

- Star pickets spaced at 2m intervals,
- Connected by a continuous high-visibility barrier/hazard mesh or flagging rope.
- Maintained at a minimum height of 1m.

Where approved works are required within the TPZ, fencing may be setback to provide construction access. Trunk, branch, and ground protection shall be installed and must comply with AS4970. Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist.

6.4 Restricted activities within the TPZ

The TPZ is an area that is isolated from the work zone to ensure no disturbance or encroachment occurs in this zone. Activities generally excluded from the TPZ (unless otherwise approved under the development consent) include, but are not limited to:

- Machine excavation and trenching.
- Ripping or cultivation of the soil.
- Storage of building materials, waste, and waste receptacles.
- Disposal of waste materials, chemicals, paint, solvents, cement slurry, fuel, or other toxic liquids.
- Movement and storage of plant, equipment, and vehicles.
- Soil level changes, including the placement of fill material.
- Any other activity that is likely to cause damage to the tree.

6.5 Trunk protection

Trunk protection must be established at the locations shown in the TPP. Where the provision of tree protection fencing is impractical or must be temporarily removed, trunk protection shall be installed to avoid accidental mechanical damage.

Specifications for trunk protection are as follows:

- A thick layer of carpet underfelt, geotextile fabric, or similar wrapped around the trunk to a minimum height of 2m.
- 1.8m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with a small gap of approximately 50mm between the timbers).
- The timbers must be secured using galvanised hoop strap (aluminium strapping).
- The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.

6.6 Ground protection

If temporary access for vehicle, plant, or machinery is required within the TPZ, ground protection shall be installed. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Where possible, areas of the existing pavement shall be used as ground protection.

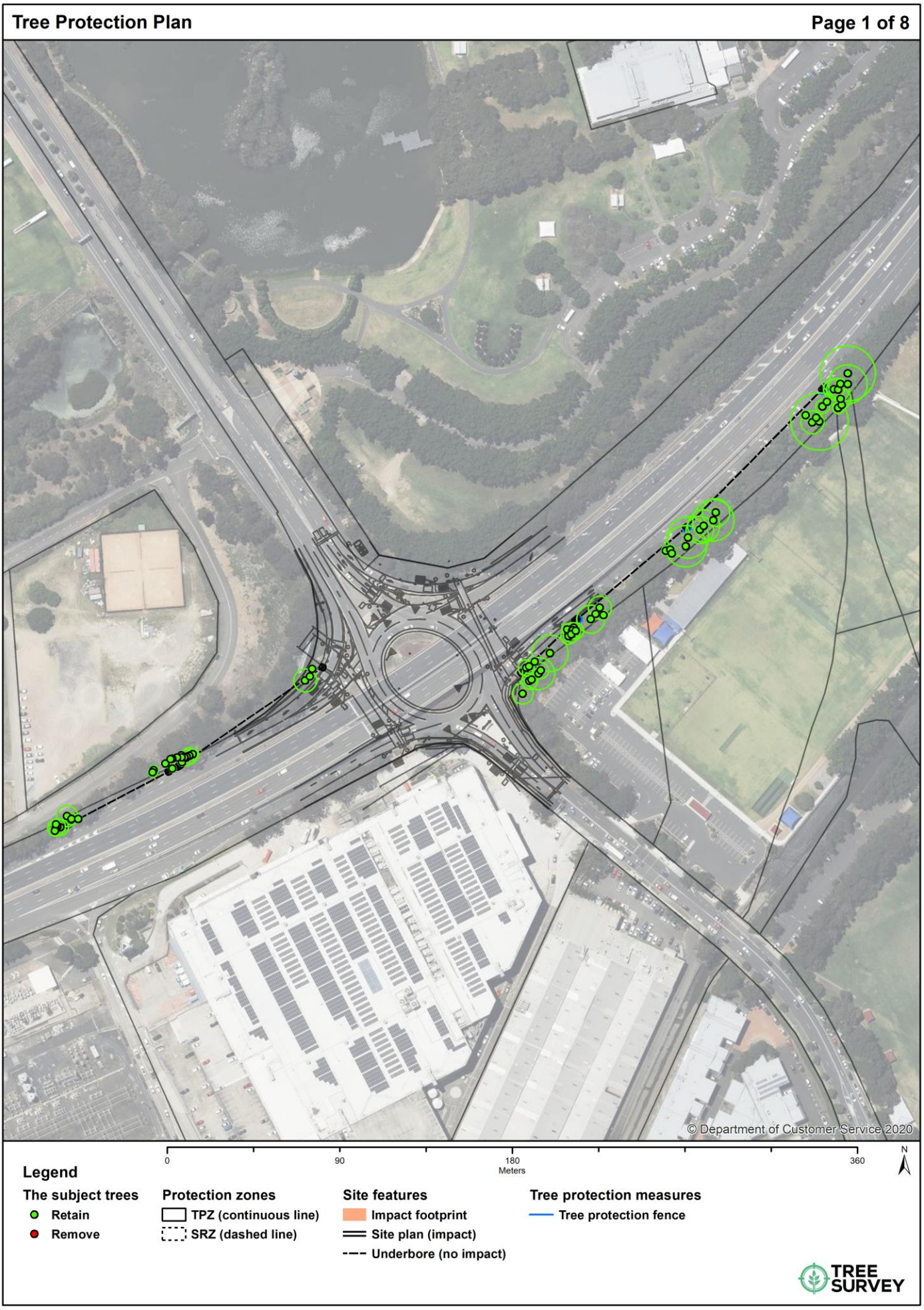
Specifications for light traffic access (<3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- A layer of mulch or crushed rock (at a minimum depth of 100mm)

Specifications for heavy traffic access (>3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- A layer of lightly compacted road base (at a minimum depth of 200mm)
- Geotextile fabric shall extend a minimum of 300mm beyond the edge of the road base.
- Heavy vehicle track mats, road plates, access mats, or similar.

Pedestrian, vehicular, and machinery access within the TPZ shall be restricted solely to areas where ground protection has been installed.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The subject trees
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Tree protection measures
Tree protection fence
TREE SURVEY


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TREE SURVEY


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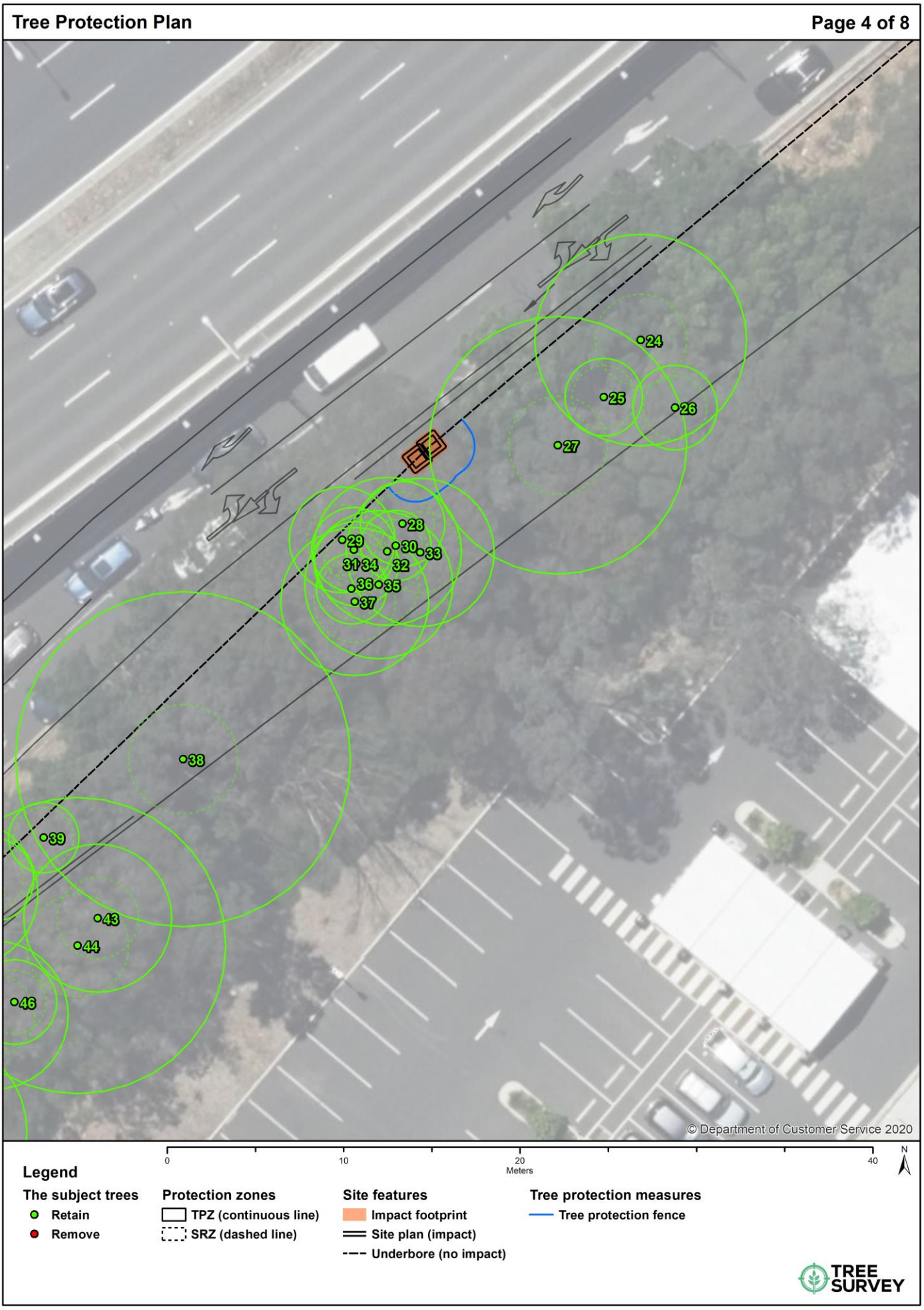
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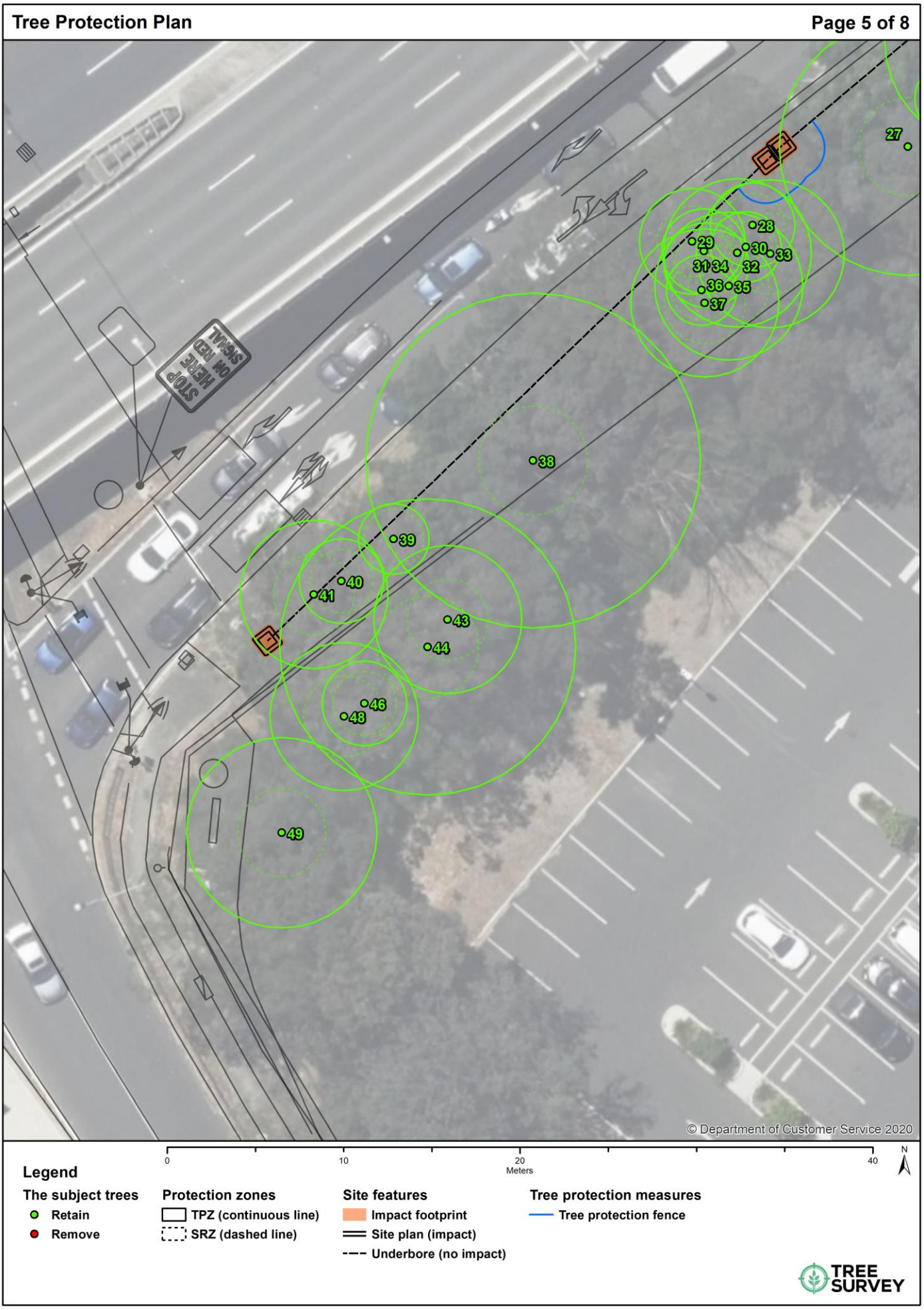
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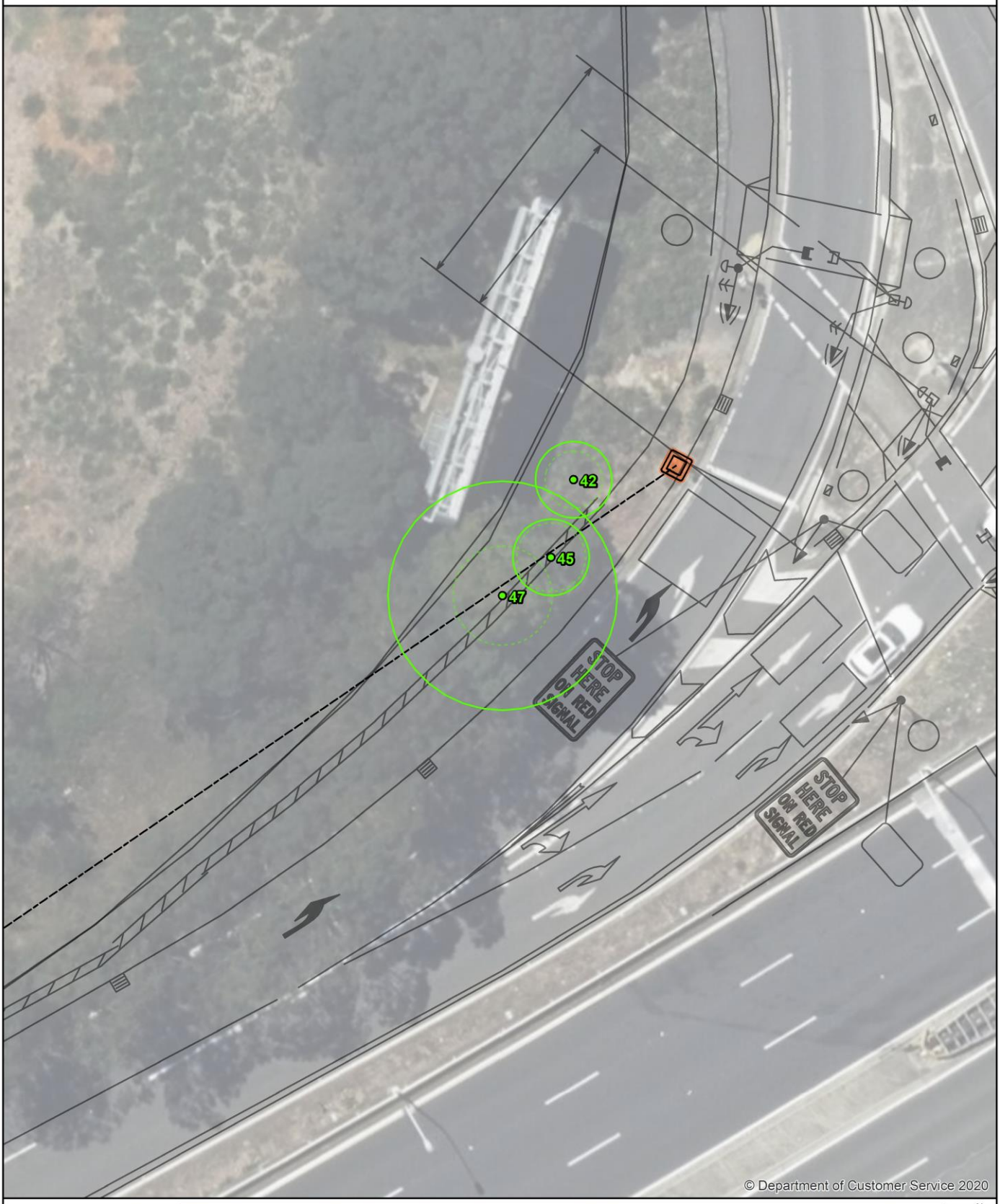

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Tree protection measures
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TREE SURVEY


Tree Protection Plan
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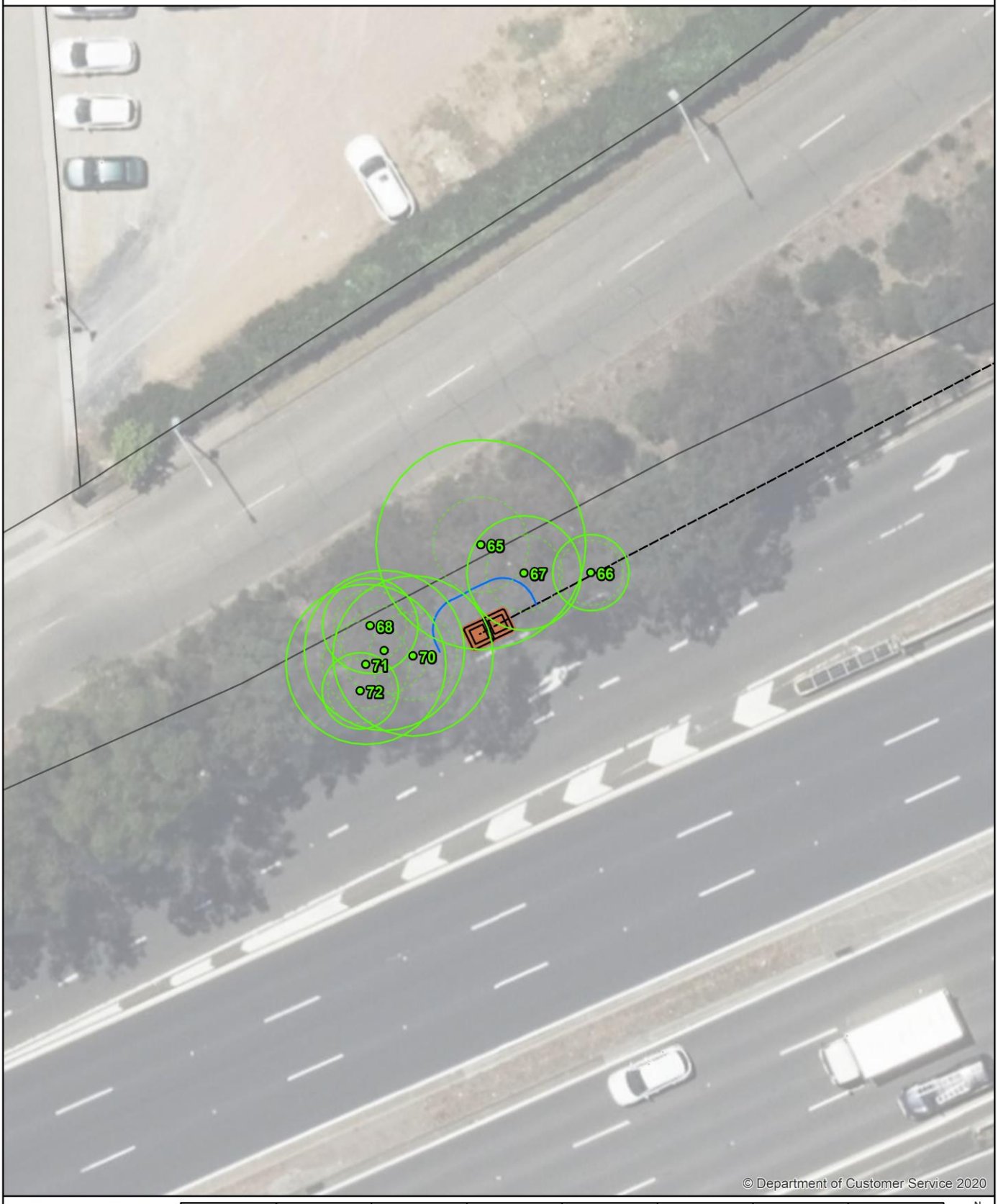

Legend

The subject trees
- Retain
- Remove

Protection zones
- TPZ (continuous line)
- SRZ (dashed line)

Site features
- Impact footprint
- Site plan (impact)
- Underbore (no impact)

Tree protection measures
- Tree protection fence

TREE SURVEY

References

Australian Standard, AS 4970-2009, Protection of Trees on Development Sites

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Mattheck, C., Lonsdale, D. and Breloer, H. (1994). The body language of trees. London: H.M.S.O.

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Appendix I - STARS© assessment matrix

The retention value of a tree or group of trees is determined using a combination of environmental, cultural, physical, and social values.

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works, and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by Australian Standard, AS4970-2009 Protection of trees on development sites.

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Aboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS). The system uses a scale of High, Medium, and Low significance in the landscape. Once the landscape significance of a tree has been defined, the retention value can be determined. Each tree must meet a minimum of three (3) assessment criteria to be classified within a category.

Tree Significance - Assessment Criteria

Low Significance	Medium Significance	High Significance
The tree is in fair-poor condition and good or low vigour. The tree has form atypical of the species The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms The tree has a wound or defect that has the potential to become structurally unsound.	The tree is in fair to good condition The tree has form typical or atypical of the species The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street The tree provides a fair contribution to the visual character and amenity of the local area The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ	The tree is in good condition and good vigour The tree has a form typical for the species The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age. The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on council's significant tree register The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity. The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group, or has commemorative values. The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ – tree is appropriate to the site conditions.
Environmental Pest / Noxious Weed		
The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties. The tree is a declared noxious weed by legislation		
Hazardous / Irreversible Decline		
The tree is structurally unsound and/or unstable and is considered potentially dangerous. The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.		

Useful Life Expectancy - Assessment Criteria			
Remove	**Short**	**Medium**	**Long**
Trees with a high level of risk that would need removing within the next 5 years. Dead trees. Trees that should be removed within the next 5 years. Dying or suppressed or declining trees through disease or inhospitable conditions. Dangerous trees through instability or recent loss of adjacent trees. Dangerous trees through structural defects, including cavities, decay, included bark, wounds, or poor form. Damaged trees that considered unsafe to retain. Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. Trees that will become dangerous after removal of other trees for the reasons.	Trees that appear to be retainable with an acceptable level of risk for 5-15 years. Trees that may only live between 5 and 15 more years. Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for 15-40 years. Trees that may only live between 15 and 40 more years. Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for more than 40 years. Structurally sound trees located in positions that can accommodate future growth. Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery. Trees of special significance for historical, commemorative, or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

Tree Significance

Useful Life Expectancy	High Significance	Medium Significance	Low Significance	Environmental Pest / Noxious Weed	Hazardous / Irreversible Decline
Long >40 years					
Medium 15-40 years					
Short <1-15 years					
Dead					

Legend for Matrix Assessment

	Priority for retention (High): These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 Protection of trees on development sites. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	Consider for retention (Medium): These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with the removal considered only if adversely affecting the proposed building/works, and all other alternatives have been considered and exhausted.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Reference

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS)
Institute of Australian Consulting Arboriculturists
Australia, www.iaca.org.au