TREE INSPECTION

PREPARED BY

PAPER STREET TREE COMPANY

For

54A WOOD STREET GREYTOWN

REPORT COMMISSIONED BY: South Wairarapa District Council

REPORT DATED: 9/12/22

EST. PS 2013

ARBORICULTURE CONSULTANCY

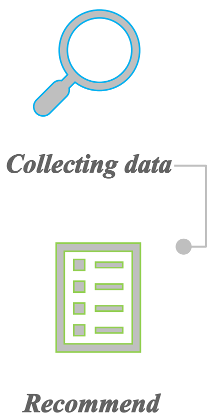
1 INTRODUCTION

1.1 I have been engaged by South Wairarapa District Council (SWDC) to assess a notable tree that stands within the road corridor within 54A Wood Street in Greytown.

1.2 The notable tree (Liquidambar (*Liquidambar stryraciflua*)) is protected under the SWDC District Plan, referenced as Tsg62. Management work is proposed that will require a resource consent, as set out in Section 21.1.1 of the SWDC District Plan. This assessment provides the necessary tree information to accompany a resource consent for the management works.

1.3 The assessment is divided into four sections, as set out in the following subsection. Additional details, background information and explanatory notes are attached as appendices.

1.4 *Layout of assessment*



2 TREE VALUE

Summarises the tree value

3 TREE CONDITION

Summaries the trees physiological/structural conditions and tree risks

4 MANAGEMENT RECOMMENDATIONS

Provide management recommendations and specifications for works

2 TREE VALUE

2017

Fig.1

The liquidambar was evaluated as part of the district's notable tree review back in 2017. The tree is not noted to have any notability details (e.g., link to a historic event, person, or for rarity etc.). At the time of the assessment, it had lost a sizeable part of its canopy (as seen in the image to the left). The tree is located adjacent to the street frontage providing landscape appeal.

Notable tree review date	9.10.17
DBH (cm)	85.30
Estimated incremental growth (cm)	0.93
Height (m)	21.6
Canopy spread 1 (m)	12
Canopy spread 2 (m)	14
Canopy area (m2):	132
STEM:	150

2022

Fig.2

Date:	25.11.22	Percentage change since 2017
DBH (cm):	88.2	+ 3%
Incremental growth (cm):	0.92	-1%
Height (m):	16	-26%
Canopy spread 1 (m):	10	-17%
Canopy spread 2 (m):	10	-29%
Canopy area (m2):	82	-38%
Canopy volume (m3):	280	-66%
Potential new STEM:	102	-32%

Summary of tree value

The data captured shows environmental and amenity values are declining (reduced canopy volume). The decrease in size and the assessed deterioration in condition (Section 3) will continue to reduce the tree's value as a landscape feature.

3 SUMMARY OF TREE CONDITION

3.1 *Physiological*

The tree exhibits around 25% dieback within its southern lower canopy. The decline is also present at the tree's apical reaches, along with density reduction and minimal shoot extension. Incremental growth is assessed as reduced over 2017 measurements, which is not surprising given the tree's condition.

A tree lays incremental growth each year. During times of stress incremental growth can reduce. The image on the right shows a cross section of a red oak (*Quercus rubra*) narrow growth rings correspond to periods of drought (stress).

Fig.3

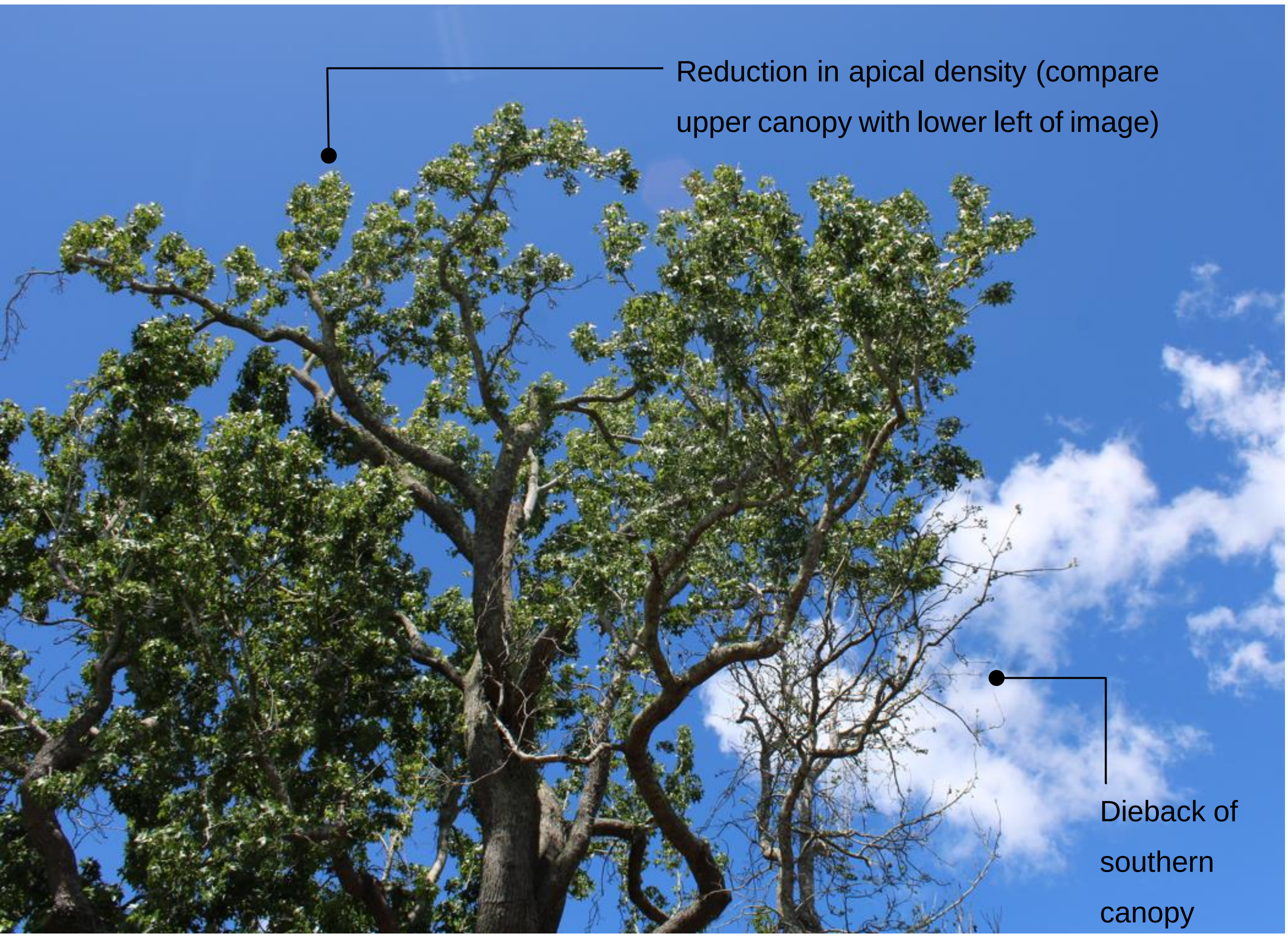
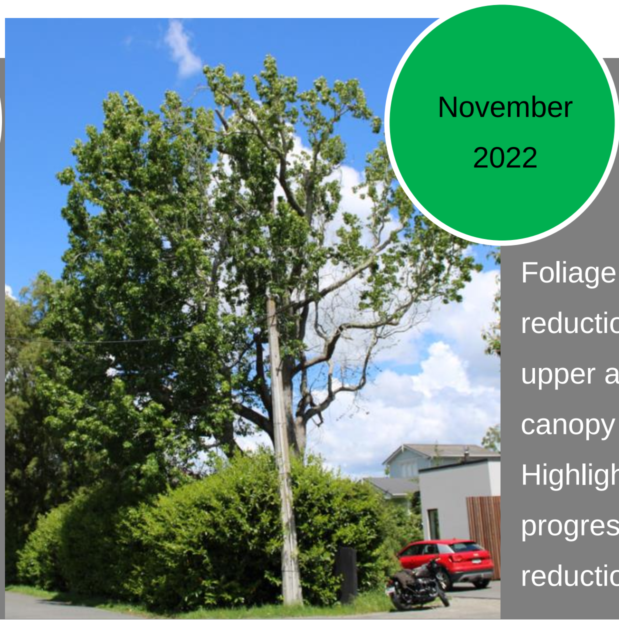


Fig.4

Fig.5



Foliage density reduction within upper and southern canopy reaches. Highlighting a progressive reduction in health

Fig.6


Fig.7

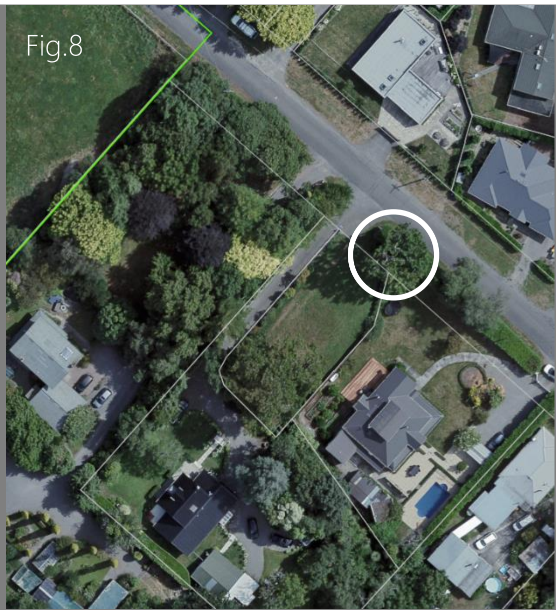


Fig.8

The image on the left is an aerial image of the site taken in 2010. The image on the right is an aerial image taken in 2021.

3.1.1 The site was cleared for development in around 2017. The development works have taken place southwest of the tree, approximately 2m from the tree's base. Dieback and density reduction correspond with the area where the development works have taken place.

Fig.9

Fig.10

3.1.2 The above images show a level drop of 21cm to the new surface level. This, and the associated foundation works, are likely to have resulted in around a 40cm level change. As the left image shows, a drain is located along the driveway's edge. This may have involved installing a soak pit, where excavation is likely to have exceeded the 40cm level change.

3.1.3 Tree roots need oxygen to function. Typically, most of a tree's root system can be found near the surface, usually within the top 600mm of soil, although roots will penetrate to deeper levels dependent on soil conditions and with respect to the genetic characteristics of the species.

Fig.11

3.1.4 Fig. 11 is an example of a tree's root spread. However, in this instance, the tree is located on an old riverbed, where the distribution of roots on the vertical plane is likely to be broader due to the rocky nature of the soil medium.

3.1.5 However, as the above image shows, roots are generally within the upper levels of the soil, and therefore, a level drop of up to 40cm would almost certainly effected/damage the tree's southwestern root system.

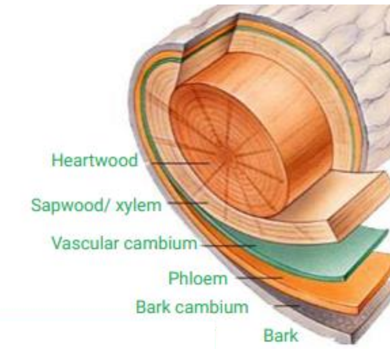
3.1.6 I have not seen the tree report that would have been required for the works. I am, therefore, unaware of what impact assessment was carried out or if protection measures were proposed or followed.

3.1.7 The loss of tree roots can cause hydraulic failure within the xylem (the conducting vessel responsible for water transport). Hydraulic failure leads to embolisms (vessels becoming aerated), creating a favourable environment for decaying fungi.

Fig. 12 Image of tree's base in 2017

Fig.13 Image of base in 2022. Dieback of bark

Fig.14



3.1.8 The above image show a considerable amount of wood dysfunction around the tree's base, compromising wood strength (wood is saturated and spongy), and its ability to transport water and nutrients. This could be seen as early white rot, but as there are thousands of different species of wood-decaying fungi a host could contain multiple wood-decaying organisms, and therefore identifying the type of fungi on site is not possible.

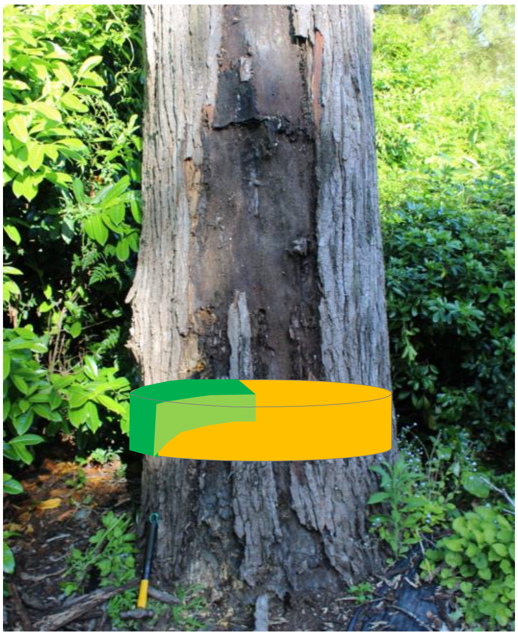


Fig.15

A sounding hammer was used to indicate areas of potential wood dysfunction. In this instance, the image on the right reflects the areas of the stem that is lilkey to contain dysfunctional wood. Only the portion of the stem to the northeastern side indicated functional wood.

Considering extent of the wood dysfunction, decaying organisms would have been present within the stem prior to the development works taking place.

However, the development works would have elevated tree stress, creating further opportunites for the fungal organism to spread, invade and compromise sapwood increasing the rate of decline.

3.2 Structural condition

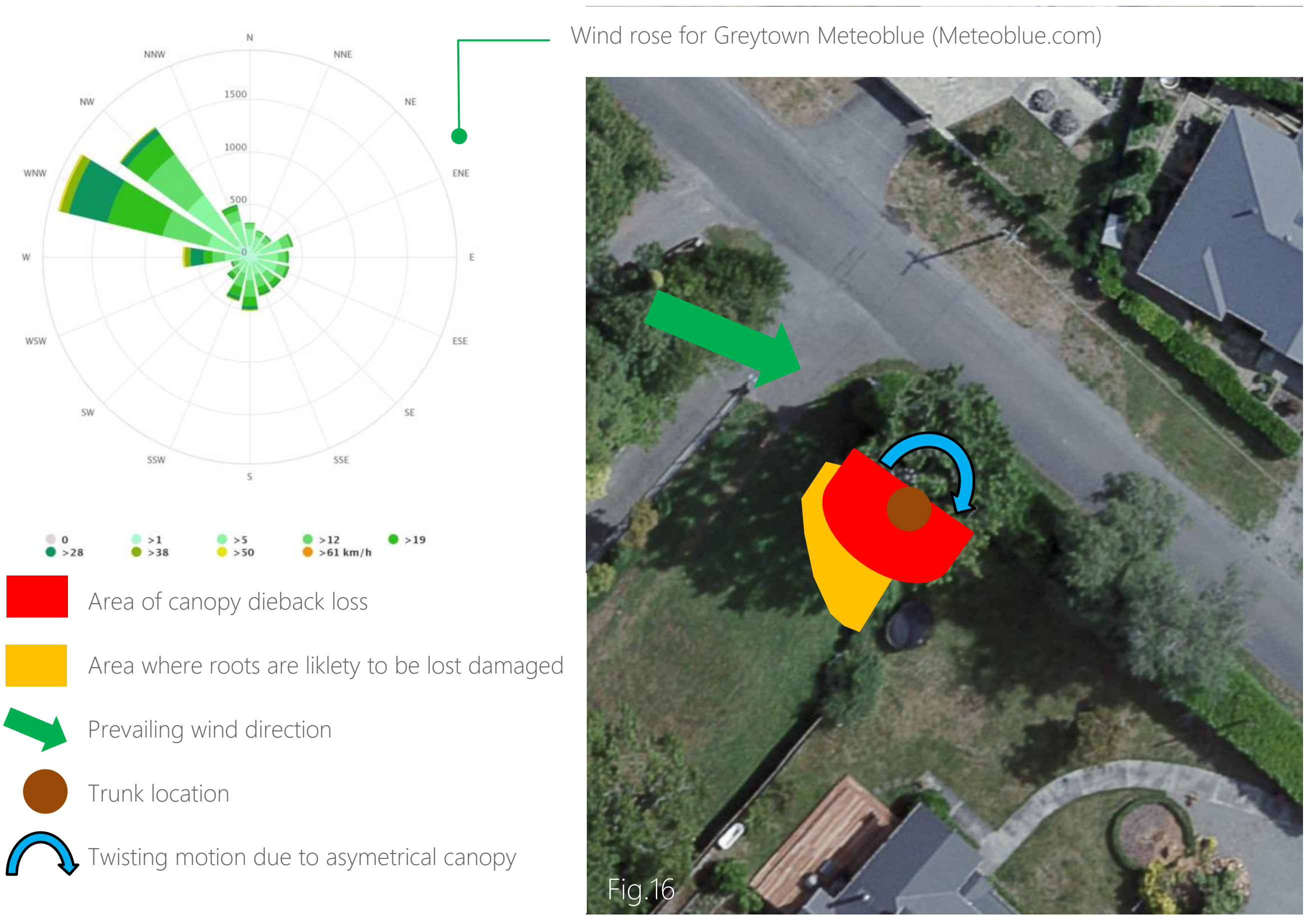


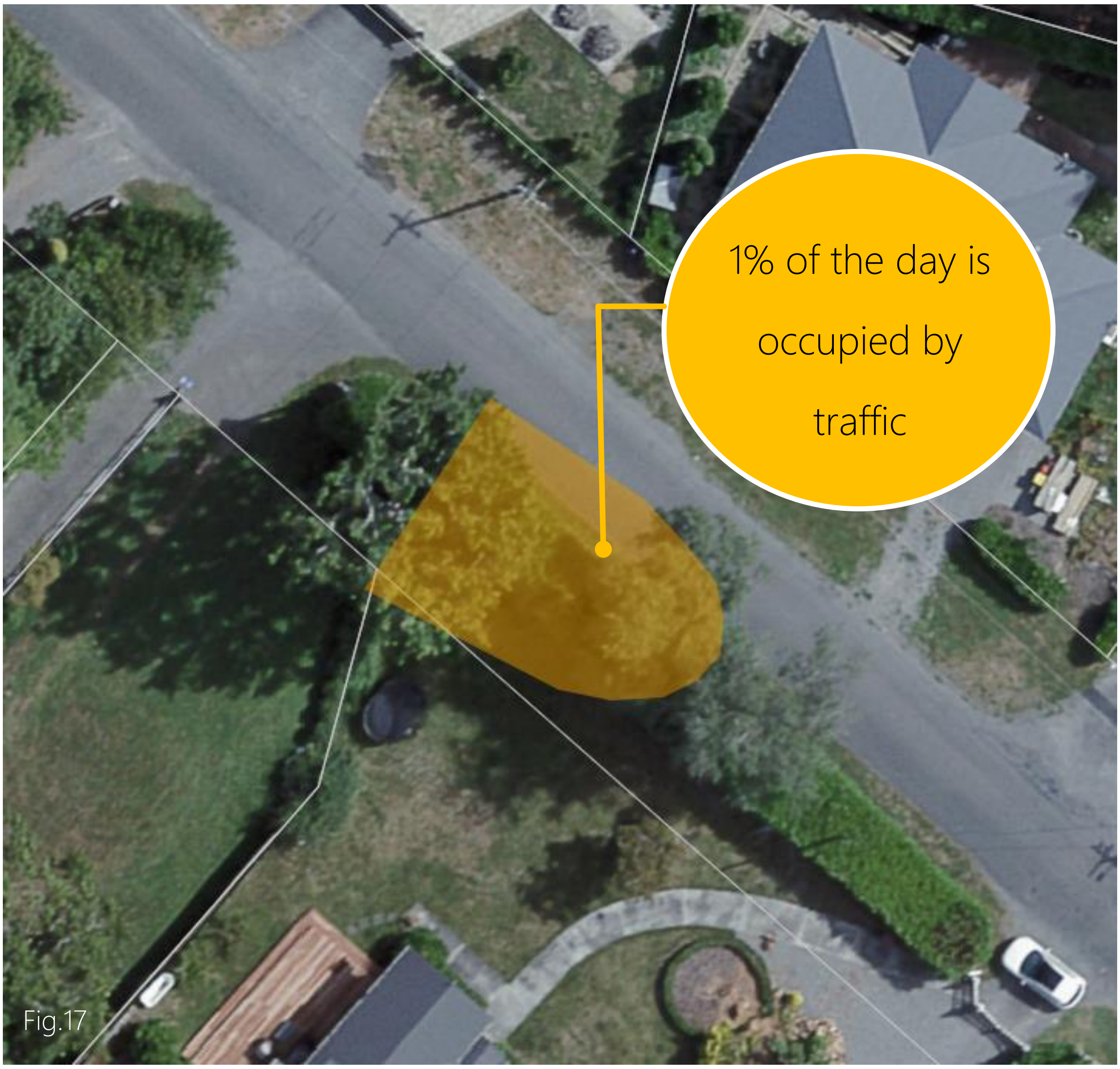
Fig.16

3.2.1 Overall, the tree's structure is assessed as poor.

3.2.2 The tree has a mechanical weakness due to decay and possible weakness caused by root loss/damage. As the previous images shows, the decay area is at the base of the stem which will spread within its roots. It is assessed that failure of the weak point would result in whole tree failure.

3.2.3 The tree has been reduced by 26%, which can lead to around 50% reduction in load at a tree's base (Rinn, 2014). Due to the reduced loading at the tree's base, the likelihood of failure is seen as emerging (i.e., low current chance of failure, but the wood-holding properties are diminishing in strength).

3.2.4 If failure were to occur, it is considered to occur during a high-wind event. The prevailing winds would cause a torsional load at the tree's base. Due to dieback and past historical loss, the tree has developed a highly asymmetrical canopy. Considering the tree's structure, the predominant wind direction, the damage to rooting area, and the slight lean east, the tree is highly likely to fall in an easterly direction.



3.2.5 The main target area is Wood St which is regarded as a low-volume road with a Daily Traffic count estimate of 511 vehicles a day (NZTA). Considering the size of the part to fail the lean and the area of likely failure, the tree would land in the orange highlighted area, as shown above. Factoring in the speed limit and vehicle count, this would equate to 1% of the day that the orange area would be occupied. This would mean a low chance of a vehicle being under the tree when a failure occurs.

3.2.6 The likelihood that the area would be occupied within the garden area is extremely low during a storm event. Therefore, the chance of a person being under the tree if the failure occurs would be extremely low.

3.2.7 Damage to the adjacent tree would be high, and for plants in the fall zone.

4 MANAGEMENT RECOMMENDATIONS

4.1 The tree has a significant structural weakness where structural integrity is declining, elevated by recent development works where there is no prospect for recovery.

4.2 To alleviate loading at the tree's base, further reduction work and a detailed inspection of the tree's condition would be required. For the tree to be retained, ongoing reporting and maintenance would be required.

4.3 The investment required for these works would exceed the benefits the tree delivers. Furthermore, future reduction works will reach a point where they are likely to become detrimental to the tree, as the loss of foliage leads to greater embolisms within the vascular system. This will further the rate at which decaying organisms can invade the sapwood.

4.4 Additionally, the carbon emitted for maintenance would exceed the carbon stored/sequestered by the tree. Any further reduction works would continue to reduce the landscape value of the tree. Leading to negative environmental benefits.

4.5 Further reduction works would also reduce amenity value as a landscape feature.

4.6 The overall risk of a person being harmed from tree failure is currently low, but the chance of failure increases if no intervention is carried out.

4.7 Therefore, I recommend removing the tree and planting a replacement tree.

4.8 Please do not hesitate to get in touch should there be any further questions or queries

RICHIE HILL

PAPER STREET TREE COMPANY

References

Rinn. F (2014). How much crown pruning is needed for a specific wind-load reduction. Western Arborist Spring 2014