Mechanised planting with the Risutec SKB240: Trials, adaptions & planting quality

Authors: Mitch White (Aspect Forestry and Contracting) and Carol Rolando (Bioeconomy Science Institute, Rotorua)

Report Number: PSP-T046

Research Provider: Aspect Forestry and BSI

Date: February 2026

INFORMATION SHEET

Report Title	**Mechanised planting with the Risutec SKB240: Trials, adaptions & planting quality**
Authors	**Mitch White (Aspect Forestry and Contracting) and Carol Rolando (Bioeconomy Science Institute, Rotorua)**
Date	**February 2026**
Intellectual Property	© FOREST GROWERS RESEARCH LIMITED All rights reserved. Unless permitted by contract or law, no part of this work may be reproduced, stored or copied in any form or by any means without the express permission of the FOREST GROWERS RESEARCH LIMITED.

Disclaimer

This report has been prepared by Aspect Forestry and Bioeconomy Science Institute (BSI) for Forest Growers Research Ltd (FGR) subject to the terms and conditions of a research fund agreement dated 1 April 2014.

The opinions and information provided in this report have been provided in good faith and on the basis that every endeavour has been made to be accurate and not misleading and to exercise reasonable care, skill and judgement in providing such opinions and information.

Under the terms of the Services Agreement, Aspect Forestry and Contracting and BSI liability to FGR in relation to the services provided to produce this report is limited to the value of those services. Neither Scion nor any of its employees, contractors, agents or other persons acting on its behalf or under its control accept any responsibility to any person or organisation in respect of any information or opinion provided in this report in excess of that amount.

Bioeconomy Science Institute™
Maiangi Taiao

TABLE OF CONTENTS

EXECUTIVE SUMMARY 4
INTRODUCTION 5
METHODS 6
RESULTS 8
DISCUSSION 10
CONCLUSION 11
ACKNOWLEDGEMENTS 12
REFERENCES 12
APPENDIX 1 13
APPENDIX 2. 15

supported by forestgrowers commodity levy

EXECUTIVE SUMMARY

This report summarises the trials undertaken in the Top of the South Region with the Risutec SKB240. The report provides details on:
the areas planted with the Risutec at OneFortyOne and Tasman Pine Forests, including adjacent manually planted blocks.

- the planting quality assessments carried out at the time of planting at both sites.
- observations made by the team operating the Risutec on machine performance and adaptions required to optimise performance
- observations made by the participating forest management companies.

Equipment reliability remained a consistent problem across all sites, as in the previous season with the M-Planter. Although the upgraded machine improved steep-slope capability compared with the 2024 trials, wet ground conditions, machine weight, and slewing limitations continued to constrain productivity and increase mechanical risk. The onboard GPS system represented an improvement, but in complex terrain it reduced efficiency and showed consistent discrepancies with PSP counts, leading to misalignment in stocking estimates. A bespoke and standardised GPS approach is needed to support safe and accurate gravitational line planting on steep slopes. Planting quality issues persisted, including poor soil compaction, incomplete planting hole closure, double planting, and occasional loose trees, indicating a need for site- and soil-specific settings or modifications to the planting beak or dibble.

The general conclusion was that while undertaking the trial was useful to demonstrate the technology, significant developments are required before it can even be considered as an option to adopt operationally.

INTRODUCTION

In 2024, Forest Growers Research Ltd, in collaboration with Aspect Contracting and Forestry (Aspect), initiated a field trial to evaluate the performance of the M-Planter mechanised tree planting system in the Top of the South (TotS) region of New Zealand (White, 2025). This trial, conducted across three diverse sites—Rabbit Island, Chestnut Forest, and Golf Road—aimed to assess the operational feasibility, planting quality, and productivity of the M-Planter in complex and varied terrain not previously trialled outside the Central North Island (Bayne et al., 2023).

The trial with the M-Planter demonstrated that while mechanised planting holds promise for improving planting efficiency, safety, and consistency—especially in challenging terrain—several technical and logistical challenges were encountered. These included machine suitability for steep slopes, planting quality variability, and operational inefficiencies due to equipment limitations and site conditions.

Despite these challenges, the trial successfully built regional capability, highlighted key areas for improvement, and provided valuable insights into machine modifications, site selection, and planting logistics. Notably, the trial confirmed that mechanised planting can access and plant areas that are difficult or impossible for manual crews, potentially increasing net stocked area and reducing labour dependency.

The aim of the project reported on here was to build on the learnings of the 2024 planting season with the M-Planter by deploying a new and improved mechanised planting system that included a GPS monitoring system and also mechanisms to improve efficiencies of getting seedlings from the nursery to the forest. While testing a new machine, the aim of the project was to focus on optimising operational efficiency, refining planting techniques, and validating cost-benefit outcomes across a broader range of sites and conditions.

The machine selected for evaluation in the Top of the South for the 2025 planting season was the Risutec SKB-240. We selected the Risutec SKB240 because:

- The M-Planter was not suited to high production planting in New Zealand terrain and there was lack of support from the distributor.
- It was a more cost effective option than the Bracke head and was available for hire from Australian distributor.
- Risutec have a key focus on mechanising silviculture and are potentially a good partner for advancing this technology into the future.
- GPS system capability provided an opportunity to guide the operator in real time to support achieving planting density and provide individual tree locations, a potential value add for machine planting.

The specific objectives of the project were to:

1. Identify adaptions to improve supply efficiency, productivity and build on learnings with the M-planter. In particular we planned to:
    a. Add a ripper extension to the planting head, reinforcement along the front edge of the planting tray and a small rake to the front of the planting head for sweeping slash.
    b. Create systemised pick up process with the nurseries that incorporated pre-filling planting cassettes and loading into trailers.
2. Determine utilisation and productivity of excavator-based planting on NZ steep terrain when adaptions have been optimised for machine performance. A time and motion study was conducted to quantify machine tasks and planting productivity.
3. Evaluate planting quality and post-planting seedling performance in comparison to manual planting.
4. Quantify operating costs for excavator based mechanised planting in comparison to manual planting.
5. Provide opportunities for participating companies to see first-hand the potential (and challenges) offered by mechanised planting on their land and initiate discussion on what is needed to optimise performance.

This purpose of this report is to document the learnings from the planting trial with the Risutec during the trial implementation phase, including perceptions of mechanised planting from the companies who participated in the trials (Objectives 1, 3 and 5). The outcome of the time and motion studies (Objectives 2 & 4) are reported on separately by Palmer and Rolando (2026).

METHODS

Trials with the Risutec SKB240 mounted on a Volvo EC220DL were carried out in collaboration with two forestry companies in the Top of the South region: OneFortyOne and Tasman Pine Forests. A total area of ~16 ha was planted with the Risutec SKB240 across two blocks at OneFortyOne and 7.2 ha across several blocks at Tasman Pine Forests.

Risutec SKB240

The Risutec SKB-240 is part of Risutec's SKB series of mechanised tree planters built for challenging terrain such as slopes and rocky ground. It's designed to integrate with excavator carriers to prepare soil and plant seedlings in one pass, helping speed up planting operations for afforestation (Figure 1)

Figure 1. The Risutec SKB240.

SKB-240 is the largest model in the SKB range, designed to handle 240 seedlings per load. Typically mounted on an excavator of approximately 14–18 tonne class. The SKB-240 uses a seedling cassette with inner cell size approximately 50×50 mm. The planting head has a dry weight of ~1400–1700 kg depending on configuration and attachments. The head has versatile soil cultivation and changeable tooling for different soil types and conditions (e.g., U-bucket, ripper, disc ripper). The head is specifically designed for operations on slopes and difficult sites where traditional planting is hard.

Hydraulic requirements:

- Hydraulic pressure: ~160 bar
- Hydraulic flow: ~160–170 L/min

Soil tool depths:

- U-Bucket subsoil depth ~650 mm
- Pitting ~550 mm
- Ripper and disc ripper ~800 mm

The SKB range can be equipped with telemetry and control systems, such as the ASTA guidance system, that allow remote monitoring and adjustment, helping ensure accurate planting densities and operational feedback when integrated with compatible systems.

For the trials described here the planting head was leased from Randalls Australia, and included the ASTA Guidance System to assist with planning and planting operations.

OneFortyOne trial sites

Mechanised planting was undertaken at Manuka Island-105 (Stand ID 851_105_05) and Carltons-160 (Stand ID 751_160_04) blocks, located at Wairau North and Golden Downs respectively. The initial plan was to mechanically plant the whole area at each site, totalling around 33 ha for the trial. However, due to machine and time limitations ~8 ha was mechanically planted at Manuka Island and ~7.2 ha at the Carltons block (Appendix 1, Figure A1 and A2). The Manuka Island site was largely flat with sloping terrain <20°. Soils at this site are classified as Allophanic and Orthic Brown (MWLR, 2019). The Carltons site was the steepest of all sites in the trial series, with average slopes ranging between 20-30°. Soils at the site are classified as Brown and Pallic in the New Zealand Classification system and are moderately drained, gravelly silty loams. Prior to planting no site preparation was carried out at either of these sites. Residue conditions at the Carltons site were described as: ex-windthrow (heavy slash/woody debris and wet ground), heavy standing hinderance test area (~0.5 ha; production drop ~35%), and general ground (typical light/medium slash).

Mechanised planting was carried out over a period of four weeks from the end of August to September 2025 with *Pinus radiata* container stock obtained from Appletons nursery. The prescription was to plant the site at a density of 800 stems per hectare (spha) with a planting spacing of 2.5 m x 5 m. No additional treatments (e.g. hydrogels, herbicide applications or fertilizer) were added during the mechanised planting operation. The machine was fitted with a 60 cm ripping tine, with the ripper being used to create a planting position before planting each tree.

At each site a block adjacent to the mechanised planted area was manually planted within the same time period for comparison of tree performance between the manually and mechanically planted blocks (Appendix 1, Figure A1 and A2)

Tasman Pine Forests trial sites

Mechanised planting was undertaken at three smaller compartments in Moutere South near Golf Road/Watkins Lane (Appendix 1, Figure A3). Most of the area planted was in the slope range of 20° to 25°, except for a small block planted ~3.5 km to the north of the main area which was flat (Appendix 1, Figure A4). The soils at these sites are classified as weathered Firm Brown and Ultic Argillic Pallic Soils in the New Zealand Classification system and are moderately well drained with gravelly silt and loamy texture (MWLR, 2019). Prior to planting no mechanical site preparation was carried out at any of the compartments.

Mechanised planting was carried out for three weeks from late September to mid-October 2025. The prescription was to plant the site at a density of 833 stems per ha (spha) with a target spacing of 2.4 m x 5.0 m. The plan was to plant some areas with a herbicide treatment or with fertiliser, however, technical issues with the functioning of these systems on the planting head meant that they were not implemented during the trial. A time and motion study was carried out during the trial by Forme Consultants. The results of this have been reported separately by Palmer and Rolando (2026). The trial was planted with *P. radiata* seedlings obtained from Arborgen nursery.

A block adjacent to the mechanised planted area was manually planted at the same time with the same seedling stock (Arborgen seedlings container stock) used with the planting machine for comparison of tree performance (Appendix 1, Figure A5). At the Tasman Pine Forests site, additional treatments were also implemented with manual planting to compare performance of different stock types with the mechanically planted seedlings. This included areas manually planted with:

- Containerised cuttings from Appletons nursery
- Containerised seedlings from Appletons nursery
- Bareroot seedlings from Arborgen (Nelson) nursery

Monitoring of planting quality and tree performance

At the time of planting each company undertook operational assessments of plant quality and planting quality to determine if the planting machine had planted seedlings to specification both in terms of quality of seedling placement and density (stocking per ha). In addition to this, at all sites permanent sampling plots (PSPs) were implemented in mechanically and manually planted blocks to compare tree performance over at least the first year after planting.

At the OneFortyOne sites a total of 26 PSPs were implemented in October 2025, 10 at Manuka Island (7 in Mech planting and 3 in Manual planting) and 16 at Carltons Block (9 in Mech planting and 7 in Manual planting).

At the Tasman Pine Forests site a total of 36 PSPs were implemented. These were spread across various treatments, including additional plots implemented in areas manually planted in 2024, adjacent to the area planted with the M-Planter in 2024 (White, 2024).

Specifically we implemented:

- 10 PSPs in mechanically planted areas planted with containerised Arborgen stock in 2025.
- 10 PSPs in adjacent manually planted areas planted with containerised Arborgen stock in 2025.
- 3 PSPs in areas manually planted with containerised Appletons seedling stock in 2025.
- 3 PSPS in areas manually planted with Appletons cuttings in 2025
- 7 PSPS in areas manually planted with Arborgen bareroot stock in 2025.
- 3 PSPs in areas manually planted with bareroot stock in 2024

Each PSP consisted of a centre point with all seedlings within a 11.28 m radius assessed resulting in a 400 m^2 plot area. For each plot we assessed aspect, slash levels (low, medium, heavy) and slope (measured with a Vertex). For each tree we assessed the health of the tree, height and groundline diameter, as well as quality of planting (Table 1).

Table 1. Factors assessed to determine the quality of the planting operation.

Assessment	Description
Good	Planting quality is good, seedling is straight, at right depth.
Deep	Planting quality is good but too deep (root collar is >10 cm below ground level).
Shallow	Seedling is planted too high. The root plug may dry out if exposed above ground level.
Loose	Planting is good, but soil compaction is insufficient.
Compact	Planting is good, but compaction is too much.
Side	Seedling is planted straight, but not directly in the centre of the planting position.
Slanted	Seedling is planted but slanted instead of being straight.
Broken	Seedling is planted, but the stem is broken.
Fallen	Planting position is unplanted, but the seedling is visible and has fallen on or near the planting position.
Missing	Planting position is unplanted, and seedling is not visible near planting position.

RESULTS

OneFortyOne NZ

General observations during trial implementation

As this was the first time that the team had worked with the machine, upskilling and learning was occurring at the same time as providing an operational service, especially at the first site which was the Manuka Island block. Productivity was therefore limited by operational skill as well as machine suitability to the terrain and several modifications were required during the operation to optimise performance. For example, planting quality was initially very poor as the planting beak was very wide at the top. This meant that if trees were planted too deeply, the beak created a hole that was too wide and difficult to seal up, with seedlings left exposed. In response, the team reduced the planting depth and adjusted the compaction feet to ensure that the planting hole was covered. After implementing this adjustment they found fewer issues with planting quality, however, it did remain a constant issue. Other modifications implemented at this first site included rewiring the loom from the head module to the planting machine with a more robust cable.

Outside of mechanical and operational issues, the team found that high soil variability and stones contributed to variability in planting quality at this site. An example of how the machine managed the harvest residues, in comparison to a mechanically prepared site is shown in Figure 2.

Figure 2. A comparison of land preparation using mechanical land preparation (left panel) versus mechanised planting machine (right panel).

Following planting at Manuka Island the team moved onto the steeper block at Carltons. While the machine was able to work on these steeper (~30 degrees) slopes in the right conditions, production was limited on slopes >27 for the number of rows possible to plant in one pass. The weight of the planting head at full reach of the machine requires significant slew power when slewing uphill on the steeper slopes. Instead of planting 4 rows at a time, the machine was limited to two rows. On the basis of these learnings it was recommended that in future a lighter planting head, such as the SKB 120, should be considered for steeper slopes.

The team trialled night shift planting at the Carlton site, which was generally found to be successful with appropriate planning. Incorporating longer shifts and night planting is seen as key to improving the utilisation of the machine and its cost-effectiveness. It was found that lighting of long slopes in the dark is not sufficient for new-line starts, a limitation that was mitigated by completing first runs in daylight and orienting night planting off the recorded GPS lines.

Plant and Planting quality
Seedling quality was assessed as good, based on company specifications, with consolidated plugs, with an average height of 29±0.6 cm and root collar diameter of 4 ±0.5 mm, and sturdiness ratio of 72.5. These metrics are in range of those published and assessed as acceptable (Aimers, 2024).

Plot assessments of planting quality by the OFO technical forester indicated that target density (800 spha) had not been reached consistently across the mechanically planted area. At Manuka-Island, the stocking was assessed at 742 spha with plot assessments ranging from 725-775 spha. At Carltons the density ranged from 525-825 spha, and was generally below the target density, with an average of 725 spha. The lower stocking range was partly attributed to heavy hinderance including windblown trees and heavy undergrowth >3m high making visibility difficult.

A summary of data collected in the set-up of PSPs is shown in Appendix 2. At the time of implementation at Manuka Island >90% trees were healthy in both the manually and mechanically planted blocks. Average stocking for the plots in the mechanically assessed areas was 789 spha and that in the manually planted areas 858 spha, with average slopes of 7-8°for both. In terms of planting quality, 60% was assessed as good in the mechanically planted areas while 83% was assessed as good in the manually planted areas. For all plots the main causes of poor planting were either insufficient compaction or off-vertical alignment, with these planting defects occurring more frequently in the mechanically planted plots.

At Carltons block, at the time of PSP implementation >90% of trees were healthy. Average stocking of the PSPs was 834 spha and 871 spha in the mechanically and manually planted plots, where slopes ranged between 14 to 30° and slash levels were assessed as medium to high. Planting quality was assessed as good for 93% of manually planted trees and 74% of mechanically planted trees with deep planting (root collar >10 cm below ground level) the main cause of poor planting quality.

Tasman Pine Forests

General Observations
Planting in general was better at this site and slightly more productive as the team were more experienced working with the machine and systems. However, several technical and operating system issues remained. This included issues working with the onboard GPS system which while useful in terms of guiding the

operator and providing a platform to identify terrain limitations (steep areas, wetlands, planting boundaries) was also inefficient at indicating the true real time planting density due to potential inaccuracies with the GPS location data, counting of aborted planting attempts and discriminating when two seedlings planted together. This situation resulted in some discrepancies in the estimation of planting densities from the ASTA system versus that from PSPs. However, the ASTA data did not exclude double plantings or aborted planting attempts, possibly inflating the estimate of stocking obtained from the on-board system.

Other issues encountered during planting at the Tasman Pine Forests site included:

- increased mis-planting with the stock type used at this site (stronger/more robust than that used at OFO site) due to trees hanging in carousel and dropping into beak with another tree when released. This issue was mitigated by trimming tall/over-flushed seedlings.
- seedling feed reliability issues with the operator replanting multiple times due to poor cassette rotation and /or flaps on individual seedling tubes being stuck (stuck hinges, plastic burrs, or debris/branches). This was a function of the hydraulic ram not retracting enough on some cog sections, preventing rotation.
- A high proportion of damaged or cut seedlings due material such as slash and/or rocks being picked up by the compaction plates.
- Inability of the fertiliser and herbicide application tools to be used due to poor design (by manufacturers).

Plant and Planting quality

The seedlings from the Arborgen nursery were scored into size bins with most scored as having an average root collar diameter of >5mm and a height of >30 cm. While most of the plugs were consolidated the seedlings were described as too tall for the machine and had to be trimmed so as not to get stuck in the planting head.

Plot assessments of planting quality were carried out on nine 0.04 ha plots by the technical forester at the time of planting. Target stocking was 833 spha with an acceptable range of 775-900 spha. The audits indicated that on average 19.4% of trees were planted poorly with 6 out of 9 plots failing on quality inspections. From the 9 plots established the average stocking of acceptable trees was only 700 spha and only 2 plots were deemed to have had acceptably planted trees within the acceptable stocking range of 775-900 spha. Not accounting for the poor quality planting, total stocking was on average 813 spha with only one plot assessed as having unacceptably low stocking and 2 plots exceeding the 900 spha threshold.

Ten PSPs were implemented across the mechanised planting areas one month after planting in Tasman Pine Forests (Appendix 2, Table A2.3). At the time of implementation an average of 8±6% mechanically planted seedlings were described as sick with a further 7±5% already dead. Planting quality was described as good for 79±13% of trees, with the main cause of defect plantings being either deep or slanted plantings. For the manually planted plots adjacent to the mechanised planted areas and planted with the same stock, 4±4% seedlings were sick, with 4±5% already dead. Planting quality was scored as good for >97% of the manually planted trees. Stocking was assessed at an average of 725 spha and 730 spha for the manually and mechanically planted trees respectively.

DISCUSSION

Common issues across sites

- While the overall reliability of the Risutec
-
- was an improvement over the M-Planter, a consistent theme across the sites was dealing with equipment issues that slowed productivity- this included jams in carousel as well as other mechanical issues.
- In terms of terrain capability the upgraded base machine, improved steep slope capability in comparison to trials with the M-planter in 2024, but wet ground, machine weight, and slewing limits still limited productivity (planting speed) and added considerations around mechanical risk.
- While having the onboard GPS system was an improvement over the previous years' trials, it also impacted production in the complex terrain. To be useful in future endeavours with this technology requires that a bespoke and standardised approach is developed that supports safe gravitational line planting in steeper slopes and complex terrain. Further to this there were consistent discrepancies

between tree numbers and location provided by the on-board system versus the counts from PSPs resulting in misalignment in the estimation of true stocking.
- Recurring issues with planting quality included poor compaction around the seedling and lack of planting hole closure, mis-planting (double trees), and occasional loose trees. These issues require that effort is invested in developing bespoke settings and/or modifications to the planting beak or dibble for different site and soil types.

Perceptions from participating companies

Acknowledging that this was a trial and a chance to observe and learn what is possible with excavator based mechanical planting, apart from the observations on planting quality which was below expectation, the participating companies commented on the cost of mechanised planting (at the planting rate delivered for the trial) which was significantly higher (~2.5 x) than manual planting (also see Palmer and Rolando, 2026). For mechanised planting to be incorporated into an operational planting programme they would need to observe either significant improvements in productivity or significant tree growth rate improvements to justify the higher costs associated with machine planting.

Other observations included:
- The limitation of the machine when ground conditions became wet and slippery.
- The time required to develop an operator's skills was a potential issue, along with the dependence on only one or two operators to deliver the planned work. For example, when the operator was off work sick, the operation was slowed or ceased. This could be an issue if it were adopted operationally. Compared to manual planting where productivity is not so heavily based on an individual's performance, but rather the crew as a whole, workers can be more easily trained to a competent and satisfactory level and individual absenteeism can be easily absorbed by the crew as a whole (dependent on crew size of course).
- Issues with the planned fertiliser and herbicide application which was not possible due to issues with these units.
- Potentially higher risks around safety and environmental impacts, with machine planting perceived to introduce more significant risks compared to manual planting on the same terrain. With manual planting there is potential for soft tissue damage through sprains and strains, lacerations and perhaps eye injury (Dickson et al., 2024). Manual planting also has very minimal potential for environmental impact. With the machine there is a chance for machine roll over on the steeper slopes which could lead to more significant injuries to the operator as well as more significant environmental impact through hydraulic fluid or diesel spills.

CONCLUSION

The general conclusion was that while undertaking the trial was useful to demonstrate the technology, significant developments are required before it can even be considered as an option to adopt operationally.

ACKNOWLEDGEMENTS

The authors, and the Precision Silviculture Programme, would like to acknowledge Tasman Pine Forests and OneFortyOne for participating in the trial. Notably Gavin Hurford and Nick Tamblyn from Tasman Pine Forests and Mike Buschl and Liam Watson from OneFortyOne. Buck Forestry are also acknowledged for providing the technical support to implement the PSPs for assessing tree growth and development measurements.

REFERENCES

Bayne, K., Botero, J., Rolando, C.A. (2023). Economic review of the M-Planter in New Zealand. Technical Report, PSP-T008. Precision Silviculture Programme, Forest Growers Research, Rotorua, NZ.

Dickson, G., Partker, R., Hooper, B., Dodunski, C (2024). Planting Injuries: Analysis of IRIS data 2020-2024. FGR Technical Report, PSP-T033. Precision Silviculture Programme, Forest Growers Research, Rotorua, NZ.

Manaaki Whenua - Landcare Research 2019. S-map - New Zealand's national digital soil map. 10.7931/L1WC7

Palmer, J. & Rolando, C.A. (2026). Mechanical planting options in New Zealand: Risutec SKB-240 planting head. Technical Note, Precision Silviculture Programme, Forest Growers Research, Rotorua, NZ.

White, M. (2024). Mechanised planting in the Top of the South region with the M-Planter. PSP-T032. Precision Silviculture Programme, Forest Growers Research, Rotorua, NZ.

APPENDIX 1

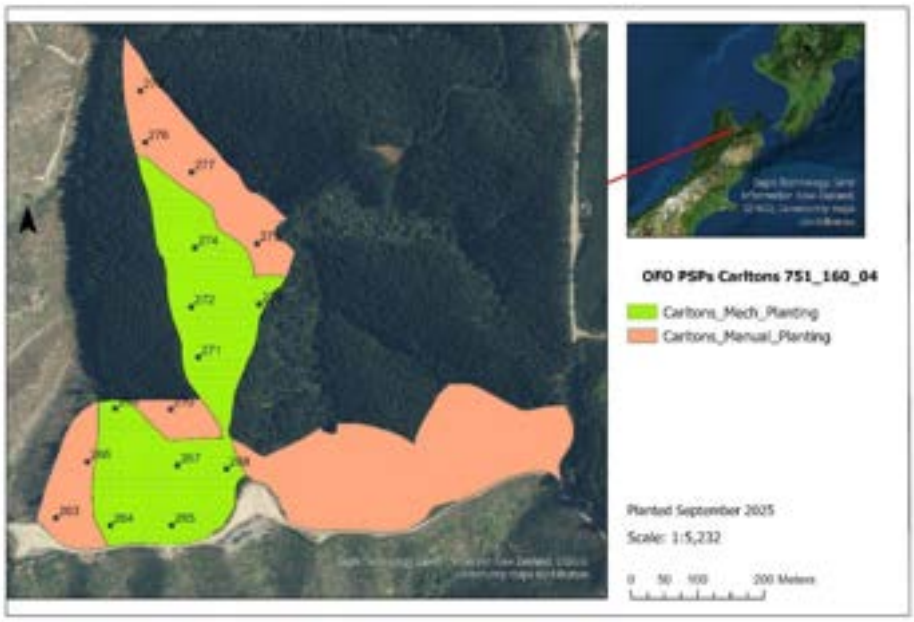

Figure A1. Mechanised planting and manual planting blocks at Carltons-160, OneFortyOne. Numbers indicate PSP plots. Total mechanised planted area=7.2 ha; Total manual planted area=11 ha.

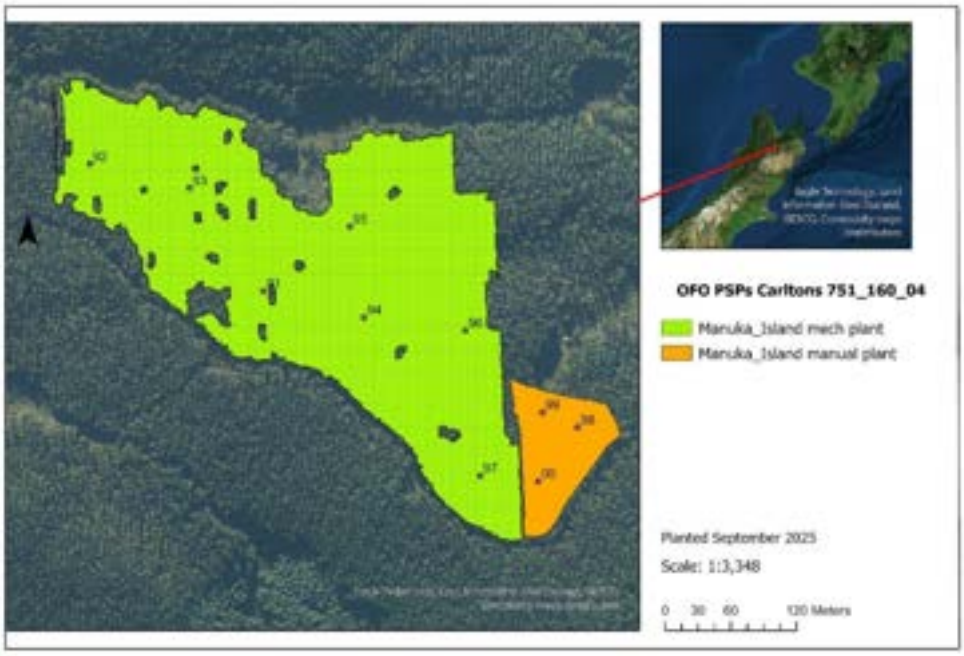

Figure A2. Mechanised planting and manual planting blocks at Manuka Island-160, OneFortyOne. Numbers indicate PSP plots. Total mechanised planted area= 8 ha; Total manual planted area=0.8 ha.

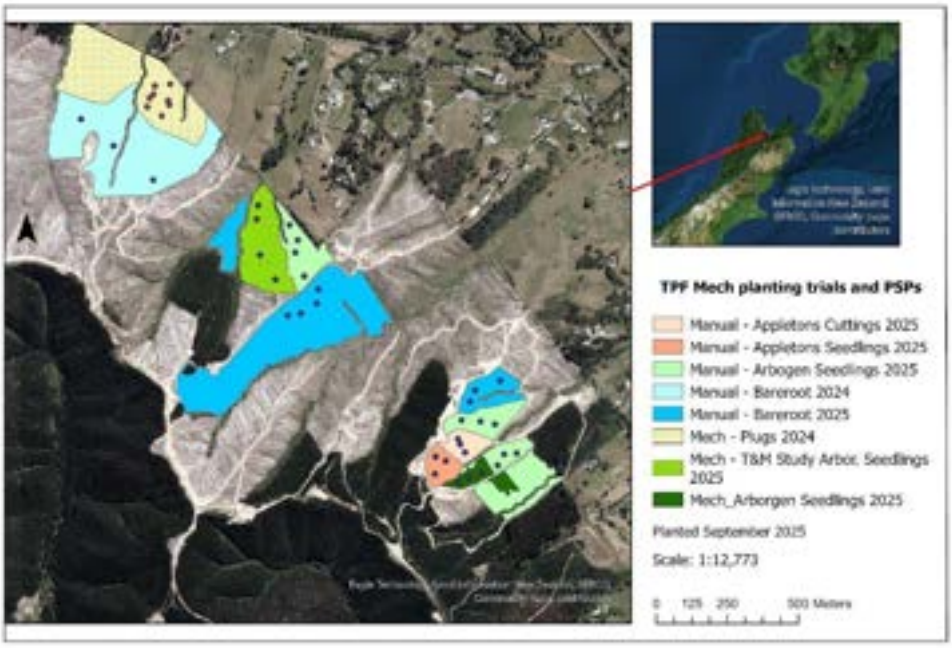

Figure A3. Mechanically and manually planted blocks at Tasman Pine Forests. Total area mechanically planted with containerised Arborgen seedlings=7.2 ha. Total area manually planted with containerised Arborgen seedlings =8.6 ha. Dots indicate locations of PSPs, Blue Dots =2025 and Red Dots= 2024.

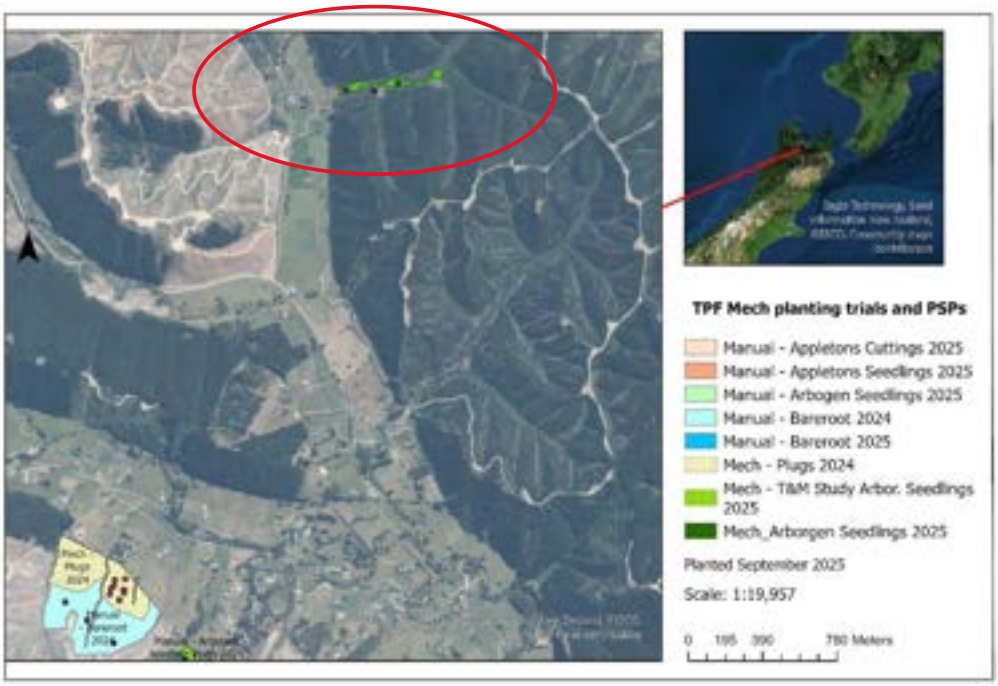

Figure A4. Mechanically block to the north of the main area at Tasman Pine Forests. Total area mechanically planted with containerised Arborgen seedlings=~1.5 ha. Dots indicate location of PSPs.

APPENDIX 2.

Baseline PSP Data collected at OneFortyOne in October 2025

Table A2.1. Summary of PSP data collected within one month of planting at Manuka Island-105. Description of planting quality scores provided in Methods.

PSP ID	Treat	Slash	Slope (Deg)	Tree Health (No. Trees)						Hgt (m)	RCD (mm)	Planting Quality (No. Trees)									
				Healthy	Sick	Miss	Dead	Tot	SPHA			Good		Deep	Shallow	Loose	Side	Slanted	Broken	Fallen	Tot
291	MECH	HEAVY	13	32	1	0	0	33	825	0.18	4.5	23	70%	2	0	1	1	6	0	0	33
292	MECH	HEAVY	10	25	0	2	0	25	625	0.22	4.4	12	44%	1	0	8	0	2	2	0	27
293	MECH	MEDIUM	6	28	2	0	0	30	750	0.18	4.4	22	73%	1	1	1	0	4	1	0	30
294	MECH	MEDIUM	12	31	0	0	0	31	775	0.16	4.3	17	55%	2	0	5	0	7	0	0	31
295	MECH	MEDIUM	4	30	0	0	0	30	750	0.18	4.3	16	53%	0	1	7	0	6	0	0	30
296	MECH	MEDIUM	3	37	0	0	0	37	925	0.18	4.2	20	54%	4	0	3	0	8	0	2	37
297	MECH	MEDIUM	8	35	0	0	0	35	875	0.15	4.2	25	71%	1	0	3	0	6	0	0	35
298	HAND	MEDIUM	9	36	0	0	0	36	900	0.21	3.7	27	75%	0	0	3	0	6	0	0	36
299	HAND	MEDIUM	10	35	0	0	0	35	875	0.21	3.9	30	86%	0	0	3	0	2	0	0	35
300	HAND	MEDIUM	2	31	1	0	0	32	800	0.22	3.8	28	88%	0	0	2	0	2	0	0	32

Table A2.2. Summary of PSP data collected within one month of planting at Carltons. Description of planting quality scores provided in Methods.

PSP ID	Treat	Slash	Slope (Deg)	Tree Health (No. Trees)						Hgt (m)	RCD (mm)	Planting Quality (No. Trees)									
				Healthy	Sick	Miss	Dead	Tot	SPHA			Good		Deep	Shallow	Loose	Side	Slanted	Broken	Fallen	Tot
263	HAND	MED	30	39	0	0	0	39	975	0.22	4.5	38	97%	0	0	1	0	0	0	0	39
266	HAND	MED	26	32	1	0	0	33	825	0.23	4.6	31	94%	0	0	2	0	0	0	0	33
269	HAND	HEAVY	25	27	3	0	0	30	750	0.21	4.7	27	90%	0	0	3	0	0	0	0	30
270	HAND	LIGHT	29	33	1	0	0	34	850	0.16	4.8	32	94%	0	0	2	0	0	0	0	34

275	HAND	MED	27	33	3	0	0	36	900	0.16	4.7	34	94%	0	0	2	0	0	0	0	36
276	HAND	MED	23	33	0	0	0	33	825	0.12	4.6	30	91%	0	1	2	0	0	0	0	33
277	HAND	HEAVY	26	33	2	0	0	35	875	0.18	5.1	33	94%	0	0	2	0	0	0	0	35
278	HAND	MED	22	39	0	0	0	39	975	0.21	4.7	36	92%	0	1	2	0	0	0	0	39
264	MECH	MED	23	31	0	0	0	31	775	0.22	4.6	31	100%	0	0	0	0	0	0	0	31
265	MECH	HEAVY	23	31	2	0	1	34	850	0.23	4.9	20	61%	8	2	3	0	0	0	0	33
267	MECH	LIGHT	14	32	1	0	0	33	825	0.22	4.8	20	61%	12	1	0	0	0	0	0	33
268	MECH	MED	23	36	1	0	0	37	925	0.21	4.5	30	81%	5	1	1	0	0	0	0	37
271	MECH	MED	22	25	6	0	0	31	775	0.14	4.8	28	90%	3	0	0	0	0	0	0	31
272	MECH	MED	21	31	2	0	0	33	825	0.13	4.6	22	67%	6	1	3	0	1	0	0	33
273	MECH	MED	23	32	0	0	0	32	800	0.17	4.7	15	47%	17	0	0	0	0	0	0	32

Table A2.3. Summary of PSP data collected within one month of planting at Tasman Pine Forests. Description of planting quality scores provided in Methods.

ID	Treat	Type*	Slash	Slope	Health	Sick	Miss	Dead	Total	Ht	Rcd	Good	%	Deep	Shall	Loose	Lean	Broke	Total
849	HAND	Arb_BR	M	28	29	2	0	1	32	0.25	6.2	32	100	0	0	0	0	0	32
850	HAND	Arb_BR	M	28	32	1	0	0	33	0.32	5.6	32	97	1	0	0	0	0	33
852	HAND	Arb_BR	M	18	33	0	0	0	33	0.32	6.2	33	100	0	0	0	0	0	33
853	HAND	Arb_BR	L	22	33	0	0	0	33	0.33	6.3	33	100	0	0	0	0	0	33
858	HAND	Arb_Con_S	L	18	33	0	0	1	34	0.28	5.8	34	100	0	0	0	0	0	34
859	HAND	Arb_Con_S	M	21	31	1	0	0	32	0.27	5.5	32	100	0	0	0	0	0	32
860	HAND	Arb_Con_S	M	13	30	0	0	0	30	0.28	6.1	30	100	0	0	0	0	0	30
861	HAND	Arb_Con_S	M	22	26	1	0	5	32	0.26	5.8	32	100	0	0	0	0	0	32
862	HAND	Arb_Con_S	M	19	24	0	0	0	24	0.26	5.3	22	92	0	1	0	1	0	24
863	HAND	Arb_Con_S	M	18	20	2	0	2	24	0.26	5.5	23	96	0	0	0	1	0	24
864	HAND	Arb_Con_S	M	17	23	3	0	1	27	0.31	5.7	25	93	1	0	0	1	0	27
868	HAND	App_Con_S	M	19	30	0	0	0	30	0.28	7.3	30	100	0	0	0	0	0	30
869	HAND	App_Con_S	L	20	29	0	0	0	29	0.28	7.1	29	100	0	0	0	0	0	29
871	HAND	App_Con_S	M	19	28	1	0	0	29	0.22	4.7	29	100	0	0	0	0	0	29
872	HAND	App_Con_C	M	25	35	0	0	0	35	0.18	4.8	35	100	0	0	0	0	0	35
873	HAND	App_Con_C	M	22	32	0	0	0	32	0.20	4.8	32	100	0	0	0	0	0	32

874	HAND	App_Con_C	H	19	30	0	0	0	30	0.15	5.7	30	100	0	0	0	0	0	30
875	HAND	Arb_Con_S	M	20	32	0	0	0	32	0.14	5.4	32	100	0	0	0	0	0	32
876	HAND	Arb_Con_S	M	23	28	1	0	0	29	0.16	5.5	29	100	0	0	0	0	0	29
877	HAND	Arb_Con_S	M	21	30	0	0	0	30	0.17	5.4	30	100	0	0	0	0	0	30
878	HAND	Arb_BR	M	17	27	1	0	0	28	0.20	5.5	28	100	0	0	0	0	0	28
879	HAND	Arb_BR	M	25	28	0	0	0	28	0.17	5.5	28	100	0	0	0	0	0	28
880	HAND	Arb_BR	M	22	32	0	0	0	32	0.17	5.5	32	100	0	0	0	0	0	32
96	MECH	Arb_Con_S	L	5	23	4	0	4	31	0.27	6.7	30	97	0	0	0	0	1	31
97	MECH	Arb_Con_S	L	4	30	4	0	2	36	0.23	6.3	35	97	1	0	0	0	0	36
98	MECH	Arb_Con_S	L	3	32	2	0	0	34	0.26	6.8	31	91	1	0	1	1	0	34
854	MECH	Arb_Con_S	M	18	31	1	0	4	36	0.32	5.7	27	75	4	1	1	3	0	36
855	MECH	Arb_Con_S	M	18	23	7	0	2	32	0.26	4.9	22	69	7	2	0	0	1	32
856	MECH	Arb_Con_S	H	18	20	2	0	4	26	0.25	4.5	20	77	5	0	1	0	0	26
857	MECH	Arb_Con_S	H	21	24	1	0	3	28	0.20	4.4	15	54	9	3	1	0	0	28
865	MECH	Arb_Con_S	M	24	24	2	0	4	30	0.32	5.3	23	77	2	0	1	3	1	30
866	MECH	Arb_Con_S	M	19	34	3	0	0	37	0.33	5.5	28	76	3	1	1	4	0	37
867	MECH	Arb_Con_S	H	21	34	0	0	1	35	0.28	7.9	29	83	3	1	0	2	0	35

*Arb_BR = Arborgen Bareroot; Arb_Con_S=Arborgen container seedling; App_Con_S=Appleton Container Seedlings; App_Con_C=Appleton Container Cutting