

BEFORE THE BOARD OF INQUIRY

IN THE MATTER of the Resource
Management Act 1991

AND

IN THE MATTER of applications for
resource consent and
notices of requirement
by Transpower
New Zealand Limited
for the North Island Grid
Upgrade Project

**STATEMENT OF EVIDENCE OF MICHAEL GEORGE COLLEY FOR
TRANSPOWER NEW ZEALAND LIMITED
(Forestry management issues / risks)**

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INTRODUCTION

Qualifications

1. **MY** name is Michael George Colley. I hold a Bachelor of Science and Bachelor of Forestry Science from the University of Canterbury, awarded in 1972. Since that time, I have worked in the forest industry in New Zealand. I am a director of Chandler Fraser Keating Limited (**CFK**), having joined the group in 1994. CFK is an independent forest industry consulting group that operates throughout New Zealand, and also in Australia and further afield. I am a Registered Forestry Consultant with the New Zealand Institute of Forestry.
2. **IN** my time with CFK, I have undertaken a wide range of projects including forest due diligence and valuation, arranging forest insurance and assessment of claims, and forest risk assessment. In 1996, I undertook a project on the proposed Wairoa to Gisborne high-tension transmission line route. The project was an assessment of compensation to land owners arising from the proposed transmission lines and the corridor occupied by them. The assessment was based on the 'highest and best' use which was deemed to be forestry. I quantified the value of the loss of land from productive tree crop and the effect of the lines on harvest operations on land adjoining the corridor.
3. I have been asked to present evidence relating to forest management and forest risk issues arising from the North Island Grid Upgrade Project (**Upgrade Project**) involving an easement (**easement**) to accommodate towers and conductors. The issues include, the effect on forest operations and management, fire considerations, and windthrow considerations. The evidence I am about to give is within my sphere of expertise.
4. I confirm that I have read and am familiar with the Code of Conduct for Expert Witnesses in the Environment Court Consolidated Practice Note (2006). I have approached the preparation of this evidence in the same way that I would for the Environment Court.
5. I have considered background material for the Upgrade Project. The material includes:

- (a) a DVD entitled "Notices of Requirement Documentation Part IA – Part XI";
- (b) a map supplied by Transpower showing land tenure in that part of Kinleith forest where the Upgrade Project would be located; and
- (c) aerial photographs of the proposed transmission route and surrounding forest land, showing access tracks to the route and existing forest roads and tracks.

6. **THE** Upgrade Project involves a 400 kV capable line (**proposed line**) between Whakamaru in South Waikato to Brownhill Road, south of urban Auckland.
7. **MY** evidence is confined to the section of the route through Kinleith forest. This is the longest section where the proposed line would traverse forest land. There are a number of other areas where forest is traversed by the proposed line.¹ While these other areas are not addressed specifically in my evidence, the principles and effects described for the Kinleith section will largely apply to other forest areas.
8. I inspected much of the proposed route from tower 379 to tower 428 in Section 15 on 10 October 2007, accompanied by my colleague Harold Corbett, Ms Sylvia Allan of MWH, and Allan Lyne, a Transpower field engineer. This section of the route lies in Kinleith forest which is managed by HFM. The inspection was on the ground and we were able to drive to various points in the forest where towers would be sited and to points along which the conductors would run.
9. **ON** Wednesday 24 October 2007, Mr Corbett and I met with staff of HFM, at HFM's Central Area office in Tokoroa. We met with Mr Alastair Deakin (Central Area Manager), Mr Dennis Bomford (Harvest Planning Manager), and Mr Jansen Melhop (Forest Information Manager).
10. **THE** purpose of the meeting was to discuss the potential effects of the Upgrade Project on forest management and operations. In particular, we concentrated on the potential effects on harvest operations, as these are the forest operations that are most likely to be affected by the Upgrade Project.

¹ These other areas include a forest area south of Hunua and two south of Paparimu.

Scope of evidence

11. **IN** this brief of evidence I discuss forestry management and operations issues, including:
- (a) Overview of the forestry process;
 - (b) Effects on forest operations;
 - (c) Fire risk;
 - (d) Windthrow risk;
 - (e) Effect on tree form; and
 - (f) Other issues.
12. I note that my evidence does not address issues of compensation to the tree crop owner or to the land owner.

FORESTRY AREAS AFFECTED BY THE UPGRADE PROJECT

13. **AS** noted above, my evidence pertains to the Kinleith forest section of the route. This section runs across land that has been in plantation forest since the 1920s.
14. **THE** principle species is radiata pine, which is the main commercial species in New Zealand. Radiata pine comprises over 99% of the area that would be affected by the Upgrade Project in Kinleith forest, with eucalyptus occupying the balance of the area. Radiata pine is grown on a rotation (growing cycle from planting to harvesting) of around 30 years. Eucalyptus is grown on a rotation of around 15-20 years.
15. **HFM** has provided me with an estimate of the area of trees within the easement defined by Transpower for the overhead line in this area. It amounts to 188 ha. The 188 ha figure relates to the total easement area, including that area that has been, and will be, converted to pasture.

16. **THE** affected trees range in age from 6 years to 34 years, with an average age of 17 years.
17. **HFM** staff state that the forest stands are the second or third crops to be grown on this land. The land has been logged at least once, and therefore carries a well-established network of roads designed to harvest standard.
18. **HFM's** stand maps also show the locations of the landings (these are the cleared areas to which felled trees are pulled and then cut into logs) used in the most recent harvest operation in each stand. Landings are re-planted in trees after harvest is completed, but the forest geographic information system still records where they were sited. This is useful information, as it is a strong indicator of where logging machines are likely to be sited when future harvesting takes place. (The location of landings is determined primarily by topography and distance from the other landings, and these factors are unlikely to change significantly from one crop to the next).
19. **THE** terrain under the alignment is generally flat to rolling with steep faces in localised areas.
20. **SIGNIFICANT** areas within Kinleith forest are currently being converted from forest to pasture, as dairy farming, in particular, is more profitable than forestry on the easier terrain in this forest. The 18 kilometres between towers 379 and 428 is presently mainly under forest, but conversion in this area has commenced. The length of this section of the route permanently under forest could be reduced to approximately 5 kilometres by the time the conversion program, as presently envisaged, is completed. I have taken these estimates from a map supplied by Transpower which indicates the eventual use of land along this section of the route.

OVERVIEW OF FORESTRY PROCESS

21. **KINLEITH** forest is a typical large plantation of introduced tree species.
22. **PLANTATION** forests are composed of a mosaic of stands of trees. Each stand comprises trees of the same age and is typically of around 20 to 100 hectares in area. The trees in a stand represent a uniform management unit,

they are planted in the same species at the same time, they receive the same treatment (involving pruning and/or thinning), and they are eventually harvested at the same time.

23. **THROUGH** the rotation, a number of operations are undertaken. These operations include the 'direct' operations of roading, land preparation, planting, releasing (weeding), pruning, thinning, harvest roading, harvesting, and log transport.
24. **THERE** are also a number of 'indirect' forestry operations. These include weed control, control of pests and diseases, inventory (periodic tree measurement), and fire control. These operations are carried out on an irregular basis as, and when, required.
25. **HARVESTING** involves both 'ground-based' harvesting and 'cable' harvesting. The former utilises machines such as bulldozers and four-wheel rubber-tyred skidders.
26. **CABLE** harvesting involves the use of stationary haulers, on either a track or rubber-tyre base, with steel towers up to 30 metres in height. They are deployed to harvest steep or broken terrain that is unsuitable for bulldozers or skidders. Wire rope cables emanate from the top of the tower and extend out in front of the hauler over the area (the 'setting') to be harvested. To stabilise the tower, wire guy-ropes extend from the top of the tower to anchor points on the ground within a 45 metre radius of the tower. The anchor points are usually tree stumps. Photographs of haulers are shown in **Appendix 1**. Felled trees are attached to the wire ropes and are winched uphill or downhill to the hauler. The distance from the hauler to the back of the largest settings is generally of the order of 300 to 500 metres in Kinleith forest.
27. **WITH** both ground-based and cable harvesting, felled trees are hauled into a central accumulation point (i.e. the 'landing') on level ground. The landing is an area approximately 50 metres by 50 metres that has been cleared of trees and stumps prior to the main harvest operation. There will be around five landings in a typical 30 hectare stand, each landing serving an average setting size of 6 ha.

28. **IT** is on the landing that trees are cut up into logs, the logs are heaped in stacks, and then loaded onto trucks. The landing is linked to permanent roads by a short 'spur' road.

EFFECTS ON FORESTRY OPERATIONS

29. **IN** this section of my evidence I discuss effects on forestry operations.

Access

30. **AS** discussed earlier, most of the roading network has now been established in Kinleith forest. Accordingly, roading is largely confined to on-going maintenance, and up-grading, prior to harvest.
31. **IT** is my expectation that the use of the roads would be largely unaffected by the Upgrade Project, but there may be the rare occasion where the transport of heavy equipment has to take "the long way around" in getting from A to B owing to the height of the equipment and proximity to the conductors on a particular road.

Controlled burns

32. **CONTROLLED** burns are a technique used in the forest industry to prepare harvest sites for re-planting. Although commonly used in the past, this technique has been used only infrequently since the mid-1980s.
33. **MOST** site preparation is undertaken using mechanical means today, but controlled burning may still be used occasionally where there is a high amount of debris left on the harvest site, such as can be the case with some species other than radiata pine.
34. I understand that Transpower would not want any large burns within 500 metres of the conductors, although this distance could be reduced if the wind direction were such that the wind took the heat and smoke away from the conductors.

35. **IN** view of the rarity of controlled burns today, and that they would be an issue only within 500 metres of the conductors, it is my view that the Upgrade Project would have no significant effect on the practice of controlled burning.

Other forest operations

36. **THE** other direct and indirect forest operations are listed in paragraphs 23 and 24. The operations at risk of interference from the Upgrade Project are those involving machines or structures that are well above ground level (more than 6 metres). Such operations include those involving aeroplanes, helicopters and harvesting.

Aerial operations

37. **AEROPLANES** and helicopters are involved in aerial surveillance and aerial spraying in land preparation, releasing, weed control, pest and disease control, and fire control operations. The operators of these machines are well aware of the risks presented by transmission lines. In this regard, Kinleith forest is similar to many other plantation forests in New Zealand in that it has been traversed by power lines (including high-tension lines) for many years.
38. **ONE** potential area of interference is where air-strips for fixed-wing aircraft are sufficiently close to the transmission lines for the lines to interfere with the operation of the air-strip. I have read Mr Nichol's evidence on aerial top-dressing and he was interested in particular in air-strips that are within 2 kilometres of the proposed line. HFM has advised me that there are no air-strips in Kinleith forest within 2 kilometres of the proposed line. There appears to be no issue with air-strips within Kinleith forest.

Harvest operations

39. **WITH** respect to ground-based harvesting machines, the Notice of Requirement documentation indicates that the design of the lines is such that the conductors would have a minimum clearance of 12.7 metres from the ground. I understand that most equipment and vehicles can be operated under the line, provided that a 6 metre clearance from the proposed line is maintained.

40. **TRANSPower** has also advised that logs can be pulled across the ground under the conductors (by ground-based machines) provided that there is no risk of cables breaking and objects hitting the conductors or towers.
41. **IT** is thus my understanding that ground-based harvesting can proceed largely as normal adjacent to, and under the proposed line. It is with cable harvesting where the potential for interference exists.
42. I have therefore concentrated on those portions of the forest under and adjacent to the proposed line where the topography is such that cable harvesting is undertaken. HFM has noted six areas where this may be the case. The six areas are in and around towers 380, 385, 396, 400-403, 405-406, and 419-422.
43. I have commissioned Mr Andrew Waites, a professional logging planner of Forest Link Limited, to prepare logging plans of the areas around these towers. Mr Waites is familiar with Kinleith forest, having undertaken logging planning on contract for HFM, and the previous forest manager since 1998.
44. **TWO** logging plans have been prepared for each tower, or set of sequential towers. The first plan shows the expected harvest method and layout of spur roads and landings in the case where no easement is present. The second logging plan shows the expected harvest method and layout of spur roads and landings but with the easement present. A pair of example plans around towers 400-403 is shown in **Appendix 2**. Examination of the respective pairs of plans shows the effect of the presence of the easement on harvest operations.
45. **THE** impact of the proposed line on cable harvesting in the six areas identified is set out in **Table 1**.

Towers	Impact on harvesting
380	▪ Nil
385	▪ Nil
396	▪ 150 m of new road ▪ An additional landing
400-403	▪ Significant areas change from down-hill cable to ground-based harvest ▪ The ground-based harvesting requires the use of contour tracks

	<ul style="list-style-type: none"> ▪ Overall cost of harvesting unchanged
	<ul style="list-style-type: none"> ▪ 3 landings now under the lines would be re-used
405-406	<ul style="list-style-type: none"> ▪ 150 m of new road
	<ul style="list-style-type: none"> ▪ An additional landing
419-422	<ul style="list-style-type: none"> ▪ 12 ha changes from down-hill to up-hill cable harvesting
	<ul style="list-style-type: none"> ▪ 2 new landings and 500 m of new road

Table 1

46. IN summary, the impacts on cable harvesting operations in these six areas are:

- (a) Some changes from down-hill to up-hill cable harvesting;
- (b) Some changes from down-hill cable to ground-based harvesting involving the use of contour tracking;
- (c) 800 metres of additional harvest roads; and
- (d) 4 additional landings.

47. THE potential effects appear to be relatively modest, but there may be some physical difficulties where the harvest system has to be changed in the two cases noted at towers 400-403 and towers 419-422.

48. THE effects noted pertain to the six sets of tower locations where interference with harvesting is expected to be the greatest. There may, however, be interference with harvesting at other tower locations, albeit to a lesser degree.

Transpower construction activities

49. I have examined maps provided by Transpower which show the access tracks required to gain access to each tower site to erect the towers and lay out the conductors.

50. IN many cases Transpower would be able to use existing tracks within the forest.

51. I have estimated that it would need to build 2.89 kilometres of new tracks outside the easement to access tower sites. In the area that is likely to remain in forest after the farm conversion program is complete, there would be the requirement to build 1.48 kilometres of new tracks outside the easement for 13 tower sites, an average of 114 metres per tower site.
52. **IN** my view, the amount of new track construction is not large and it is unlikely to provide any significant interference with forest operations. Indeed, it may provide a small benefit in providing additional access to forest stands.

FIRE RISK

53. **ELECTRICITY** transmission lines have caused fires in New Zealand forests on a number of occasions. However, to my knowledge the fires in question have not involved high-tension transmission lines.
54. **DURING** the preparation of my evidence, I discussed the issue of fire risk associated with higher tension lines with Mr Bernie Mayers, Managing Director of Agricola Crop insurance (**Agricola**) in Australia. I approached Mr Mayers as Agricola is a major insurer of tree crops in Australasia, and Australia itself represents a high-risk fire environment from time to time.
55. **IN** his email of 4 October 2007 he stated that:

"We in fact consider major high voltage power lines in wide, fuel-reduced easements less of an issue than low-voltage power lines transecting forests. Historically, a higher fire incidence has been associated with the latter with no known incidents associated with the former. We find that government authorities are very particular about these high-voltage lines and, given the potential economic losses associated with grid shutdown (from fire), authorities maintain a high standard of fuel reduction. My understanding is that the lines are spaced with such a swing that arcing risk is low. Some of our clients consider these easements highly effective fire breaks. In practice, we have not loaded policies with such high-voltage lines transecting the plantation".

56. **THIS** correspondence confirmed my view that high-tension lines do not represent an increased risk factor for fire.

57. **THE** situation in Australia is different from that in New Zealand. In Australia, active steps (e.g. regular mowing) are taken to control the amount of flammable vegetation in the high-tension corridors. There is less compulsion to do this in New Zealand, because fire conditions do not reach the extremes, over long periods, seen in Australia. The climate and distribution of rainfall in the Waikato region, in particular, makes for a much lower fire risk than in Australia.
58. **MY** experience with high-tension line corridors in the Central North Island is that they tend to carry naturally-grown scrub and small trees. Such vegetation tends to be dense and contains a high proportion of lighter fuels (being dead herbaceous vegetation, and dead leaves, twigs, and branches). It thus has a relatively high fuel loading of finer fuels which, when dry, will carry a fire well.
59. **IN** summary, the presence of high-tension lines in Kinleith forest appears to present only a low risk of fire from the lines themselves. However, there may be a risk from the presence of vegetation as described in the previous paragraph (where a fire may be initiated, and/or where the vegetation will carry a fire more readily than pine forest) rather than from the high-tension lines themselves. This risk would arise only where the easement adjoins areas (including public highways) frequented by the public.
60. **IN** the event of a fire, the towers and conductors are significant hazards in fire fighting, and this can be accentuated by reduced visibility from smoke.
61. **THERE** is some increase in administration in that the forest owner must notify and liaise with the lines owner in the event of fire.

WINDTHROW RISK

62. **AS** a stand grows, the trees around the perimeter ('edge trees') grow to withstand greater exposure to wind. They are more robust than trees within the stand and provide protection against wind. Removal of edge trees increases the exposure and susceptibility of trees within the stand that previously had mutual shelter.

- 63.** **THE** development of the easement would create a significant length of new stand edge that does not have the protection afforded by edge trees. The trees along this edge would be susceptible to occasional wind damage, particularly where the trees are around 10 years or older. Beyond this age, the susceptibility of trees to windthrow or stem breakage increases with age as the trees increase in height. Trees of this age occupy 172 ha or 91% of the area occupied by the easement.
- 64.** **FORESTS** in the Central North Island region have suffered from two catastrophic wind events in the past 25 years. Cyclone Bernie in April 1982 caused extensive wind damage, mainly in forests to the east of Kinleith. Cyclone Bola in March 1988 caused extensive damage, including in Kinleith forest.
- 65.** **BOTH** storms produced winds from the south-east direction and it appears that the most damaging winds come from this direction. The location of the Central North Island forests in the lee of the axial North Island ranges, where wind accelerates and turbulence increases, is the reason.
- 66.** **THE** stands damaged in Cyclone Bola were salvaged over the following three to four years and re-planted. The extent of the damage can be gauged by looking at present-day maps of the forest which show the year of planting.
- 67.** I have asked HFM to supply such a map and it is included in **Appendix 3**. The map extends north from Whakamaru to around tower number 397 and thus covers the southern two-thirds of the easement area within Kinleith forest.
- 68.** **IT** is seen that extensive areas in and around the easement area were established in the period 1989 to 1991 and thus indicate that Cyclone Bola damaged this part of the forest. From my own experience, I flew over the affected areas shortly after the storm and I remember that a large area across the lake from Mangakino township was badly damaged.
- 69.** **IT** is my view that forest in the southern half of the easement area in Kinleith forest is thus vulnerable to damaging winds from the south-east and that the risk of damage would be increased through the creation of exposed stand edges along both sides of the easement.

- 70.** **IN** my view, once a stand has been harvested and re-planted, the existence of the greater length of stand edge ceases to be an issue in relation to wind risk. This is because the previously exposed stand edge (without edge trees) is now replaced by a stand edge with naturally-grown edge trees.
- 71.** **THE** risk of increased windthrow is therefore associated only with the existing tree crop, and only where the trees are around 10 years and older. As noted earlier, 91% of the affected trees are in this category.

EFFECT ON TREE FORM

- 72.** **THE** growth of individual trees reflects the immediate environment in which they grow. Edge trees (the trees along the perimeter of a stand) receive more light on the exposed side than do trees within a stand. Branches on the open side grow to utilise this light and hence are larger than those on similar trees within the stand.
- 73.** **BRANCH** size is an important determinant of log quality and the resulting value because it affects the strength of lumber. Where trees are pruned (i.e. the branches on the lower 4 to 6 metres of the stem are removed), branch size is not an issue. Otherwise, branch size is important over that part of the stem where unpruned sawlogs are produced, generally extending up the stem to the point where the diameter reduces to 200 mm.
- 74.** **UNLIKE** potential effects caused by windthrow, the tree form effect is generally expressed in the younger stands, around 15 years and younger, whilst branches in the lower section of the stem are still developing.
- 75.** **THE** creation of the easement would therefore result in a higher proportion of the lower-valued edge trees in the younger stands traversed by the easement. Unlike windthrow risk, this effect would endure beyond the existing crop of trees.

OTHER ISSUES

- 76.** **AN** important issue in the forest industry and the electricity transmission industry for a number of years has been the maintenance of the vegetation on

the land within transmission corridors. Specifically, the issue has been: "Who is responsible for this task?".

77. I understand Transpower would be responsible for managing the vegetation (but not to pay for the cost of weed control). There is thus no effect on the forest owner through it having to extend its management and operations activities into the easement area.
78. **THE** forest manager is, however, exposed to the cost of any weed control. I consider that any risk of additional cost would be low.

APPROACH TO ADDRESSING IMPACTS

79. **IN** areas close to public highways, or other areas frequented by the public, and where the presence of vegetation in the easement area heightens the risk of fire in comparison to vegetation in the immediately adjacent forest, the risk can be minimised by managing the vegetation in proximity to the highway and public areas.
80. **IN** my opinion, all other impacts of the proposed line on other areas of forest management and operations would need to be addressed by negotiation during the easement acquisition process.

ISSUES RAISED IN SUBMISSIONS

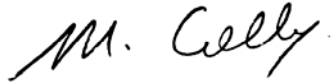
81. I have seen and read submissions from two parties: Hancock Forest Management NZ Ltd (**HFM**), (**Submission No. 1014**) and Murray Parrish (for Carter Holt Harvey Ltd) (**CHH**) (**Submission No. 0558**).
82. **HFM** raises the issue of loss of productivity of the land under the proposed line. However, I understand from discussions with representatives of HFM, that this is no longer an issue with Transpower proposing to purchase an easement which addresses this loss.
83. **HFM** raises the issue of constraints to, and additional costs of, forest operations. It gives cable harvesting and burning as examples. I have covered these two operations in my evidence.

- 84.** **CHH** raises the issue of the easement width being 64 metres. The minimum width of the designation is 65 metres, and the maximum width of the designation indicated in the NOR through the forestry areas is 100 metres. The required width of the easement through forestry areas will depend on several factors including topography and the location of landings.
- 85.** **CHH** also raises the issue of smoke columns and quotes Transpower's advice that they should be kept 500 metres or more from the easement to avoid arcing and similar disruption to electricity transmission. This conforms to my understanding of Transpower's requirements as described earlier.

CONCLUSIONS

- 86.** **THE** main impact of the Upgrade Project would be on harvesting operations where additional roads and landings, and potentially more difficult tree hauling, would be experienced at certain points along the route.
- 87.** **THE** impact on other forest operations would be relatively minor.
- 88.** **TRANSPOWER** would construct a number of new tracks to access the easement for the purposes of building the towers, rigging the conductors, and on-going maintenance. These tracks are not expected to unduly affect forest operations.
- 89.** **THE** presence of high-tension lines per se is not expected to increase the risk of fire in the Kinleith plantation. However, the vegetation growing in the easement, where the easement adjoins public highways and other public areas, represents a place where fires may take hold more readily than in the adjacent stands of plantation trees. This risk can be mitigated through management of the vegetation.
- 90.** **THE** creation of the easement would increase the risk of wind damage in adjacent stands from catastrophic wind events. This risk would exist over much of the southern half of the easement. It would diminish when the present generation of trees is harvested during the next 25 years.
- 91.** **THE** presence of the easement would create a higher proportion of edge trees in the adjacent stands. Edge trees have larger branches and consequent

lower log quality and value than trees within the stand. This effect would endure over future generations of trees.

A handwritten signature in black ink, appearing to read "M. Colley". The signature is written in a cursive, flowing style.

Michael George Colley

1 February 2008

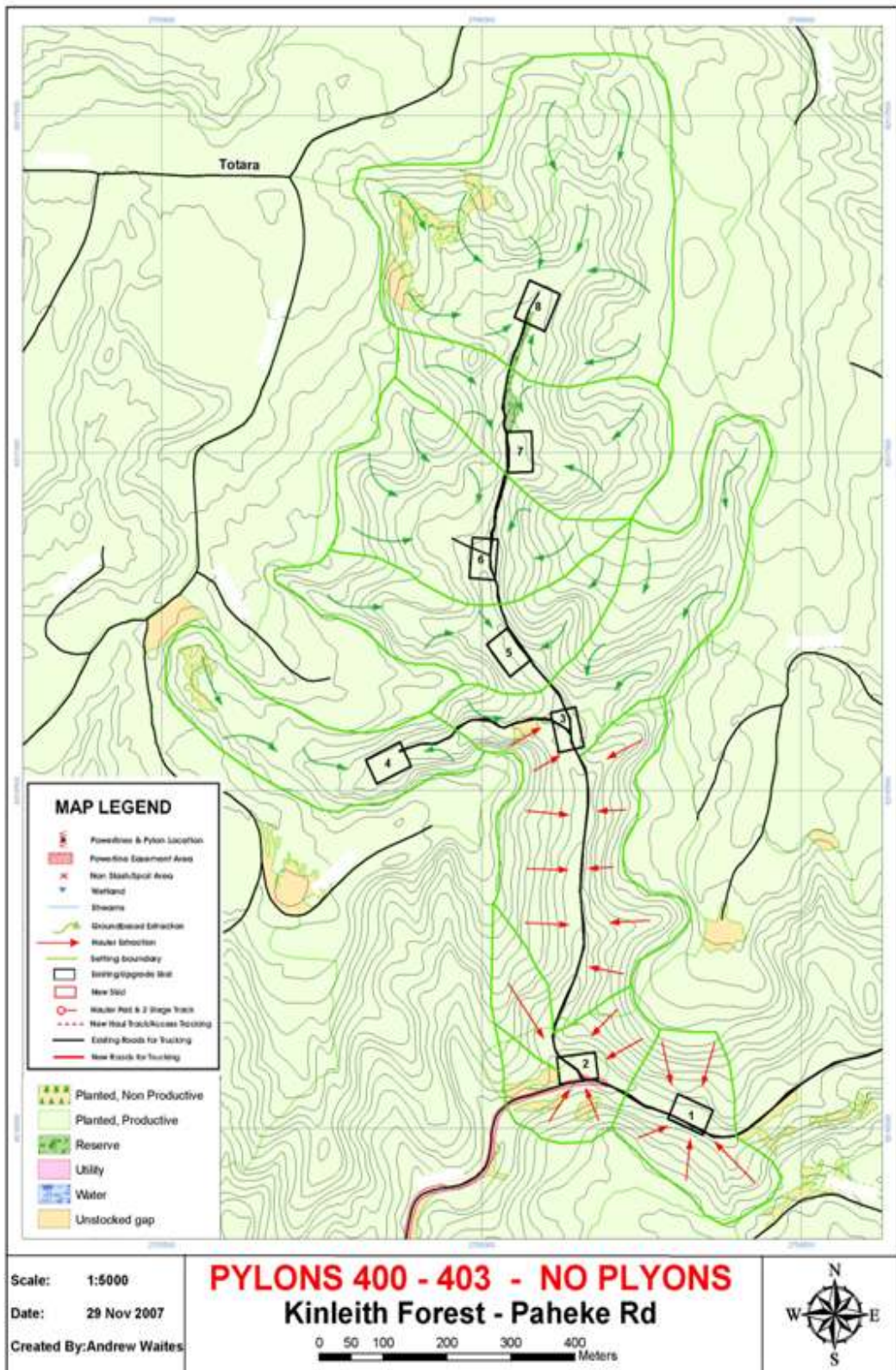
Appendix 1
Haulers Used to Harvest Steep Terrain



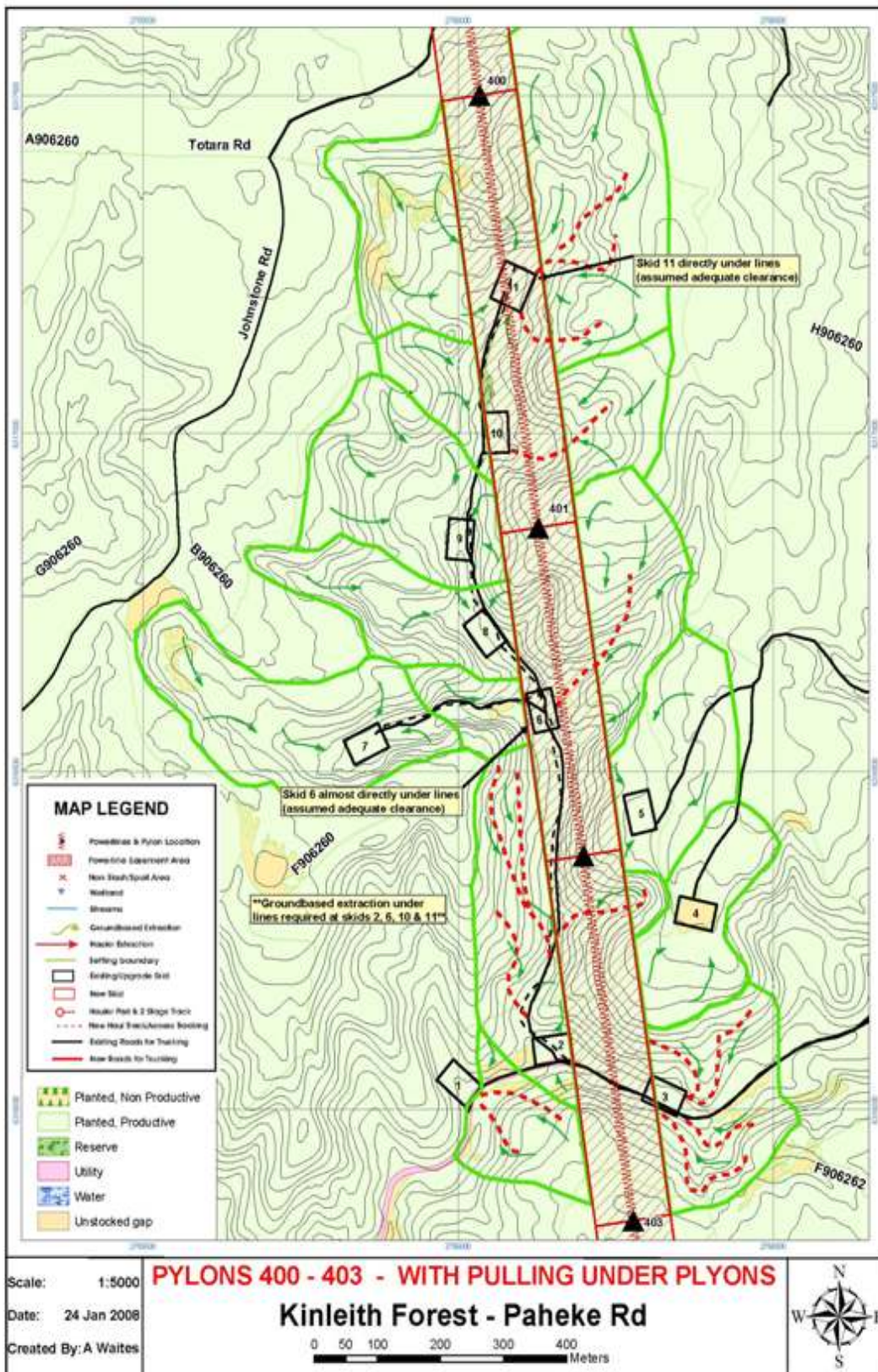
Appendix 1 (cont.)
Haulers Used to Harvest Steep Terrain



Appendix 2
Logging Plan – No Easement



Appendix 2 (cont.)
Logging Plan – Easement Present



Appendix 3
Map Showing Years of Planting

