

***DOTHISTROMA* GENETIC GAIN TRIAL  
— ESTABLISHMENT REPORT**

**G.T. Stovold**

**Report No. 11**

**April 1995**

# FOREST & FARM PLANTATION MANAGEMENT COOPERATIVE

## **EXECUTIVE SUMMARY**

### ***DOTHISTROMA* GENETIC GAIN TRIAL — ESTABLISHMENT REPORT**

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This report details the establishment in 1993 of four trials, two on high *Dothistroma* hazard sites, to obtain an accurate estimate of the reduction of disease levels and increase in growth that can be expected from the use of seedlots derived from the *Dothistroma* resistant breed. The design uses three seedlots with similar Growth and Form ratings (GF25 to 26) but with a wide range of expected *Dothistroma* resistance (DR0, 7, and 16). Replicated large plots are separated from each other by a four-row planting of a non-*Pinus* species (varies by site). Each site has plots where *Dothistroma* will be kept to insignificant levels by the application of copper fungicide. Comparison between these plots and the infected plots and between the two low hazard and the two high hazard sites will allow for accurate estimates of loss of growth due to *Dothistroma* infection.

## INTRODUCTION

This report details the establishment of 3 trials in 1993 with the objective of obtaining an accurate estimate of the reduction in disease levels and increase in growth rate that can be expected from the use of seedlots in the Dothistroma Resistant Breed.

## DESIGN

Three control pollinated seedlots with similar ratings for Growth and Form (GF25 to 26) but with a wide range of expected Dothistroma resistance (DR 10, 16 and 22) were planted at 3 sites, 2 where Dothistroma infection is expected to be heavy and 1 where no Dothistroma infection is expected. Replicated large plots of each seedlot and of an equal mix of each seedlot were planted at each site. Large plots are separated from each other by a 4 row buffer of non-radiata (see below for buffers used by site). Large plots were used so that the size of the spore population in each plot would be influenced by the degree of resistance of the seedlot e.g high-resistance = lower infection level = reduced spore population.

The trial includes plots where Dothistroma infection will be kept to insignificant levels for as long as possible through fungicide application. These blocks will be used to measure growth on a stand basis in the absence of significant Dothistroma infection. Comparison between these plots and the infected plots will allow for accurate estimates of loss of growth due to Dothistroma infection.

There is also at each site a small row plot experiment to compare Dothistroma resistance, growth and form of the experimental seedlots with seedlots now being put into operational plantings.

## TREATMENTS

| Treatment no | Treatment   |
|--------------|---|
| A            | No special fungicide control, Seedlot 1                                     |
| B            | No special fungicide control, Seedlot 2                                     |
| C            | No special fungicide control, Seedlot 3                                     |
| D            | No special fungicide control, Seedlot 1,2,3<br>planted in single-tree-plots |
| E            | Special fungicide control, Seedlot 1  |
| F            | Special fungicide control, Seedlot 2  |
| G            | Special fungicide control, Seedlot 3  |

On the site where Dothistroma infection is expected to be nil, only treatments A to D are planted.

## SEEDLOTS

**Seedlot 1:** Dothistroma Resistant Breed - Selected for High Dothistroma resistance as well as good growth and from. 94/702 (GF 25 DR 22)

**Seedlot 2:** Growth and Form Breed - selected for high growth rate on non-Dothistroma sites with a moderate level of Dothistroma resistance. 94/704 (GF 26 DR 16)

**Seedlot 3:** High growth , low resistance - selected for high growth rate on non-Dothistroma sites but low Dothistroma resistance. 94/703 (GF 26 DR 10)

**Seedlot 4:** Climbing select seedlot 88/102 (GF 7)

**Seedlot 5:** Gwavas 850 Seed Orchard 3/3/87/01 (GF 14)

## IMPLEMENTATION OF WORKPLAN

Seeds for each seedlots were made by control pollination during the 1990 to 1991 pollination years.

## NURSERY SOWING

Seeds for each seedlot were counted out, stratified, then hand sown into three nursery replications in the NZFRI nursery as block sowing's. Seeds for the row plot portion of the trial were hand sown into rows over three nursery replications.

## SITE ACQUISITION

The process of acquiring and laying out of the trials began in January with a request being made to members of the New Zealand Radiata Pine Breeding Cooperative for suitable sites (uniform, suitable climate, medium to high fertility, freedom from weed problems, good access). All sites offered were visited and the best of those offered were selected. Allocation of trials to site was done and laying out of each trial was begun. Sites chosen for these trials were

**Site 1** 4.4ha of second rotation area in Tarawera forest owned by Tasman Forestry Ltd, adjacent to Pukemaire rd. Altitude is approximately 200m and the site was pre-plant sprayed, line raked then ripped and mounded. This site falls away to the SE with a slope of approximately 5 degrees. It is at this site were no Dothistroma infection is expected. Details for this site can be found in appendix I.

**Site 2** 7.3ha of second rotation area in Kinleith Forest owned by Carter Holt Harvey Forests Ltd, off Thorpe road in cell A7315, of approximately 280m in altitude. This site is flat and was pre plant sprayed then V-bladed at 3.5m centres. Details for this site can be found in appendix II.

**Site 3** 7.3ha of second rotation area at Cpt 93 in Kaingaroa Forest owned by the Forestry Corporation of NZ Ltd. This site is also effectively flat Altitude is around 480m and the site was pre-plant sprayed and roller crushed . Details for this site can be found in appendix III.

## FIELD LAYOUT

Laying out of sufficient no of rep/sets using a theodolite and measuring tape was carried out leaving out any areas of the site which appeared to be significantly different from the rest of the site. Rep sets were demarcated with numbered 2" x 1" treated stakes in each corner. A rough map of the trial was drawn then taken back to NZFRI and a copy made using Autodesks 'AUTOSKETCH'. Replication and treatment allocation within rep were added to the map at this stage.(see Appendices I,II, and III).

## NURSERY SEEDLING SURVIVAL COUNTS

During April of 1993 seedling survival counts were made to determine if sufficient seedlings of each family had grown to allow the trials to be established according to the workplan design. The survival counts showed all seedlots had produced sufficient seedlings.

## TRIAL LIFTING

Lifting and sorting of each trial was begun in the week before field establishment. Lifting of a site proceeded thus. For the large plot portion of the trial, for each field replication/treatment 49 trees were lifted and sorted into seven bundles of seven trees and placed in a labelled bag.. For the row plot portion of the trial, 6 trees of each seedlot were lifted and bundled per field replication and placed in a plastic bag.. The trees were then placed in the coolstore in planting boxes awaiting planting.

## TRIAL ESTABLISHMENT

The trees were then loaded into planting pods and were transported to the site where an experienced silvicultural gang supplied by the co-operator who owns the site was used to plant the trial. Trial planting proceeded thus, the appropriate replication/treatment bag of trees is brought to the pegged plot about to be planted. Bundles of seven trees are given to the seven planters who then while being guided by planting strings to produce accurate planting spacing (4m x 4m) planted their seven trees in a random order. After all plots had been planted including the row plot portion, the planting gang was used to plant the buffer portion between the plots which was planted at 2 x 2m spacing. The buffers used varied by site due to stock availability and are listed below

Site 1: FR204/1, Tarawera forest, Pukemaire rd *P.radiata* (non-Dothistroma site, no infection expected)

Site 2: FR204/2 Kinleith Forest, Thorpe rd, *C.macrocarpa*

Site 3: FR204/3 Cpt 93, Kaingaroa, A mix of *E.delegatensis* and *E.dendramorpha*

## APPENDIX I

## TRIAL DESCRIPTION SHEET

FOREST OWNER: Tasman Forestry Ltd

EXPT. No.: FR 204/1

FOREST: Tarawera

CPT.: Pukemaire rd

CONTACT PERSON: Dave Darling

PHONE: 07 322 8511

FAX: 07 322 8451

CONTROLLING AGENCY: FRI-Genetics and Tree Improvement

WORK PLAN #: 1931

PROJECT: GTI

FRI CORR. File:

PURPOSE: To obtain an accurate estimate of the reduction in disease levels and increased growth from the use of Dothistroma Resistant Breed seedlots

## SITE DETAILS:

LATITUDE: 38°8 '

LONGITUDE: 176°31 '

ALTITUDE: 220m

ASPECT: SE

SLOPE: 5°

GROUND PREPARATION: Ripping and Mounding

SOIL TYPE: Tarawera Ash

PREVIOUS USE: Forest Plantation

## EXPERIMENTAL DETAILS:

SPECIES: P.radiata STOCK: 1/0 DATE PLANTED: 9/7/93

# OF PLOTS: 32 SIZE OF PLOTS: 44 x 44m and 20 x 24m SPACING: 4 x 4m

TOTAL AREA: 4.4ha DEMARCATION: Numbered posts

## EXPERIMENTAL DESIGN:

Replicated block planting of 4 seedlots and 4 treatments with a 4 row buffer between plots, reps split between infection and no infection plots, and a 12 replication row plot demonstration area

## PROPOSED TREATMENT:

Chemical control of Dothistroma in non-Dothistroma replications.

PROPOSED YEARS OF ASSESSMENT:

PERMANENCY: 25 Years

## ATTACHMENTS:

Trial Description Sheet

Trial Register Sheet

Stand Sheet

Trial Map

Single-tree-plot data for seedlot 4 blocks.

FR

EXPT:

204

SUB EXPT.:

1

| Forest   | Compartment | P/year | Total Area<br>(ha.) |
|----------|-------------|--------|---------------------|
| TARAWERA |             | 1993   | 4.4                 |
|          |             |        |                     |
|          |             |        |                     |
|          |             |        |                     |
|          |             |        |                     |

Landowner

Tasman Forestry Ltd.

Purpose: (100 characters maximum)

TO OBTAIN AN ACCURATE ESTIMATE OF --  
THE REDUCTION IN DISEASE LEVELS FROM  
DOTHISTROMA RESISTANT BREEDS.

Species Codes:

P. RAD

Keywords: (up to 6 words or phrases of 35 characters)

DOTHISTROMA RESISTANT BREED

GROWTH AND FORM BREED

DOTHISTROMA INFECTION

Experiment  
Start yr.

1990

Current  
PlotsPlots  
TerminatedControl  
Agency

FRI

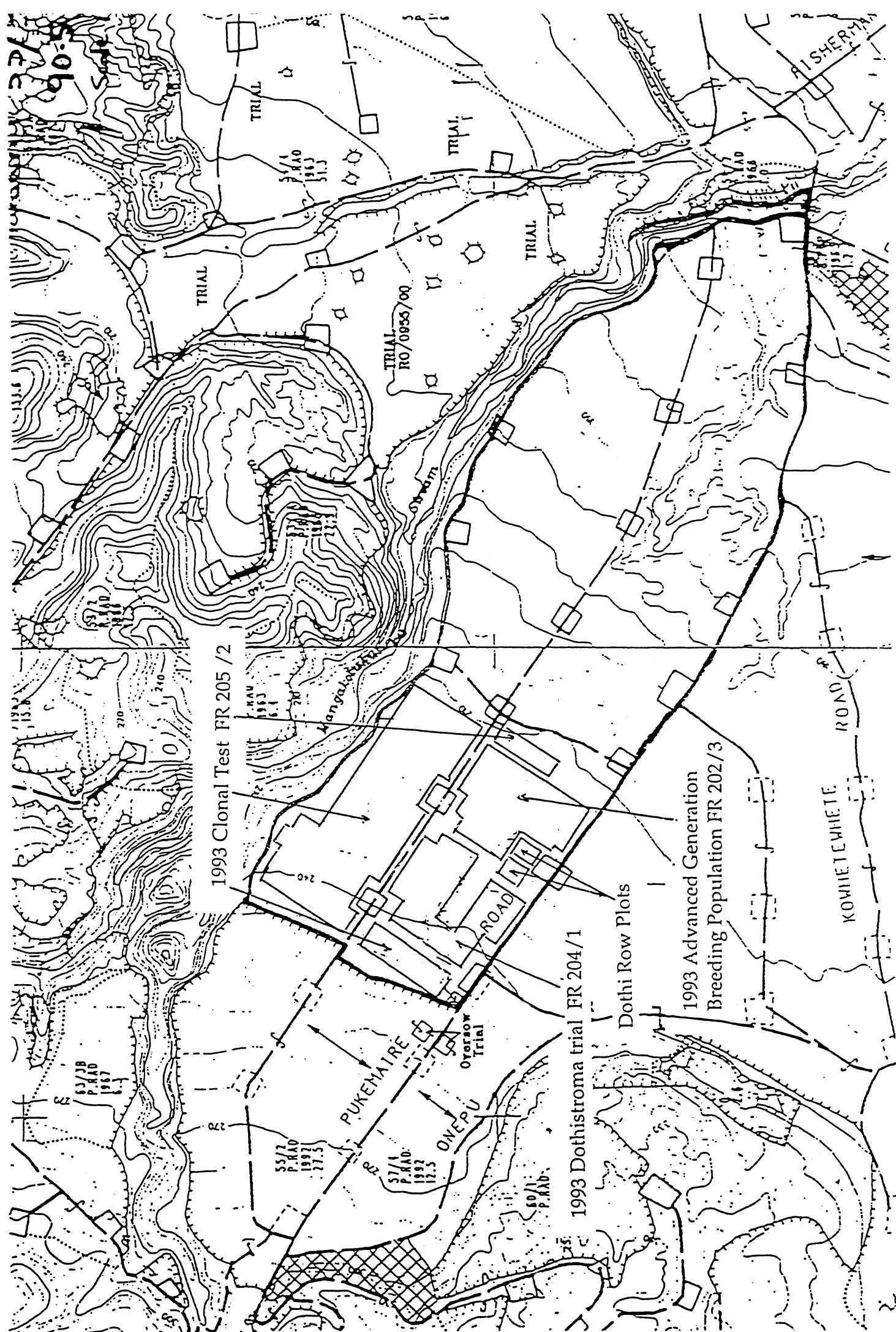
FRI related  
ProjectsFRI  
WP/no.

1931

Related  
Programs

Contact Officer:

GTI

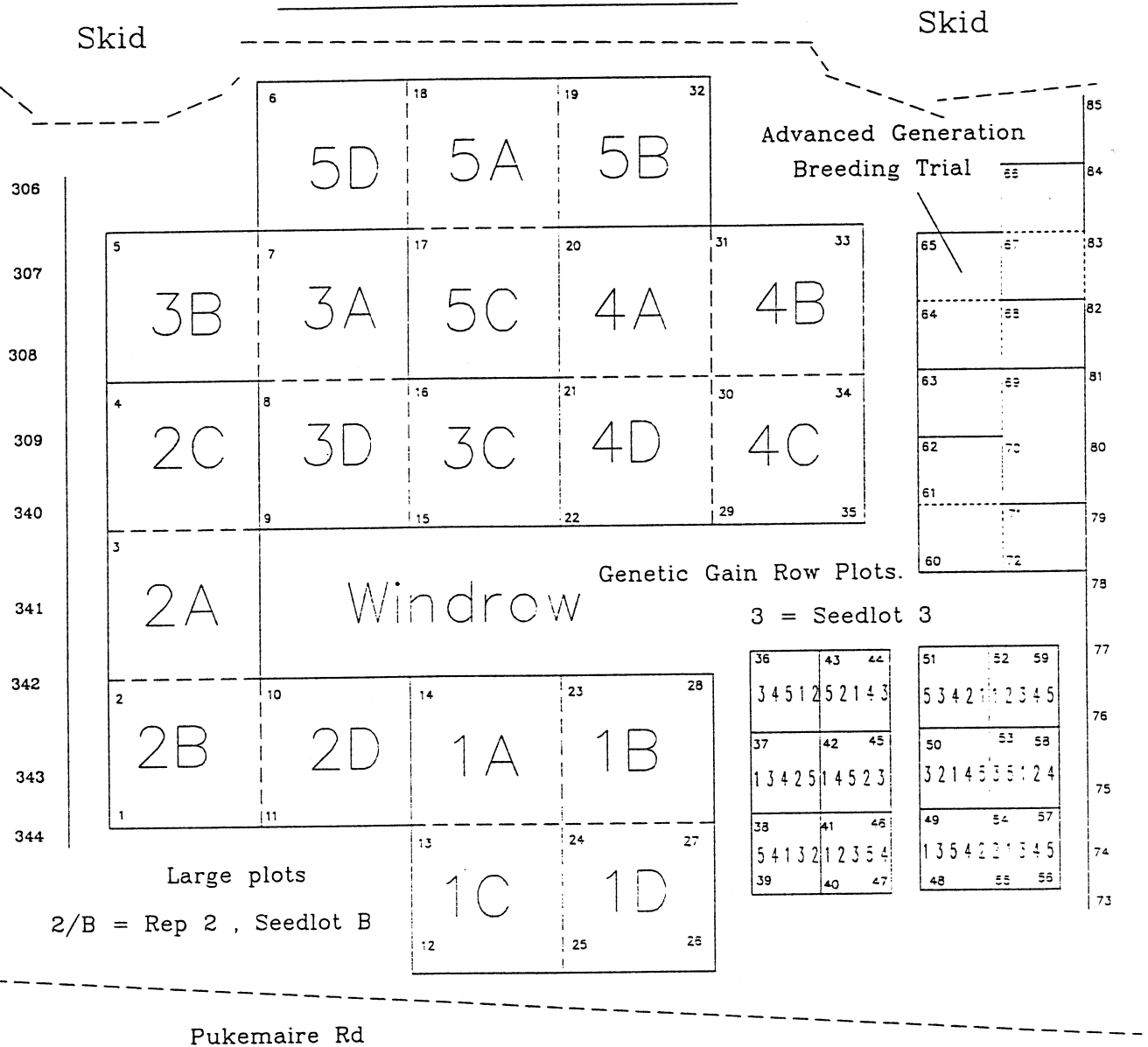




# 1993 Dothistroma Genetic Gain Trial

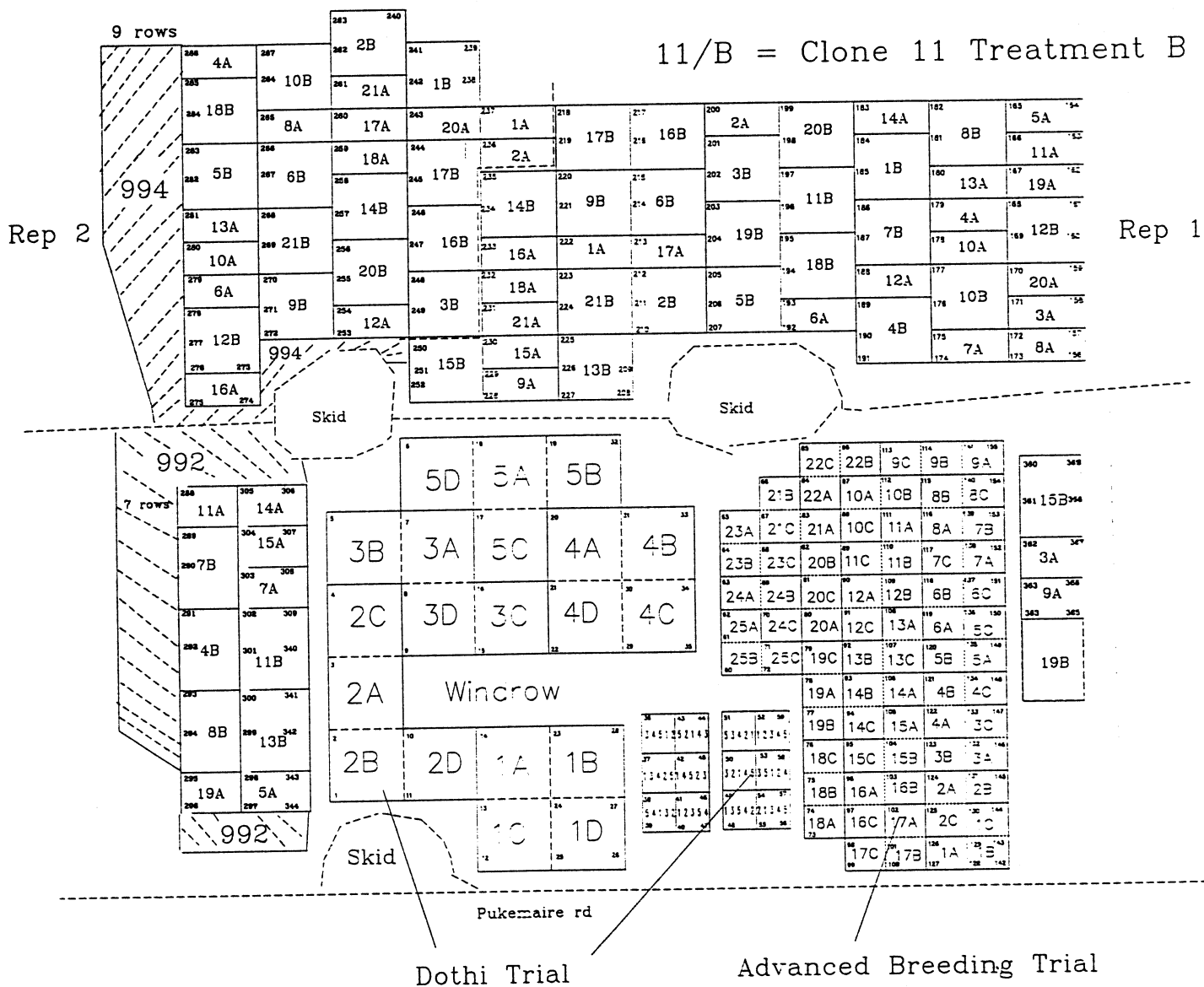
Tasman Forestry Ltd Pukemaire Rd.

Non-Dothi Site FR 204/1 WP 1931



Sept 1993

1993 Clonal test. FR 205/2  
Tasman Forestry Ltd Pukemaire Rd.



992 = Lower Bago  
994 = Tallaganda (OPSO)

FR 204/1  
Tasman Forestry ltd  
Pukemaire rd, Tarawera Forest  
STP Blocks for Dothi trial

3 D

8 16  
1 3 3 1 3 3 3  
1 2 2 1 2 1 3  
2 1 2 1 3 1 3  
1 2 3 1 2 3 3  
1 2 1 1 2 2 3  
1 2 2 1 2 2 3  
1 2 2 1 3 3 3  
9 15

2 D

8 16  
2 3 3 2 1 3 2  
2 3 1 2 1 3 2  
2 3 3 3 1 1 1  
2 3 2 1 1 1 1  
2 3 2 3 1 3 1  
2 3 1 3 1 3 2  
2 3 2 3 1 1 2  
11 13

1 D

24 27  
2 3 3 3 3 3 1  
3 1 2 1 2 2 1  
2 3 1 3 2 1 1  
3 3 2 1 2 2 1  
3 1 3 3 2 1 2  
2 1 3 1 1 2 1  
2 2 1 3 3 2 1  
25 26

4 D

21 30  
3 1 2 1 1 1 1  
2 3 2 2 2 1 2  
1 1 3 3 3 3 2  
1 2 2 3 2 1 2  
1 1 1 3 3 3 2  
3 2 1 1 3 2 3  
3 2 1 2 2 3 3  
22 29

5 D

6 18  
1 3 2 2 3 2 1  
2 1 3 2 1 3 1  
2 1 2 2 3 3 1  
1 1 3 2 1 3 1  
2 3 2 2 3 3 3  
2 3 2 2 1 3 1  
2 1 3 2 3 1 1  
7 17

## APPENDIX II

### TRIAL DESCRIPTION SHEET

FOREST OWNER: CHH Forests Ltd

EXPT. No.: FR 204/2

FOREST: Kinleith

CPT.: Thorpe rd, A7315

CONTACT PERSON: Fred Burger

PHONE: 07 886 2799

FAX: 07 886 9632

CONTROLLING AGENCY: FRI-Genetics and Tree Improvement

WORK PLAN #: 1931

PROJECT: GTI

FRI CORR. File:

PURPOSE: To obtain an accurate estimate of the reduction in disease levels and increased growth from the use of Dothistroma Resistant Breed seedlots

#### SITE DETAILS:

LATITUDE: 38°25 '

LONGITUDE: 176°0 '30"

ALTITUDE: 280m

ASPECT: NW

SLOPE: 0°

GROUND PREPARATION: V blading

SOIL TYPE:

PREVIOUS USE: Forest Plantation

#### EXPERIMENTAL DETAILS:

SPECIES: P.radiata STOCK: 1/0 DATE PLANTED: 12/7/93

# OF PLOTS: 47 SIZE OF PLOTS: 49.5 x 38.5m and 17.5 x 24m SPACING: 4.5 x 3.5m

TOTAL AREA : 7.3ha

DEMARCATIION: Numbered posts

#### EXPERIMENTAL DESIGN:

Replicated block planting of 4 seedlots and 4 treatments with a 4 row buffer between plots, reps split between infection and no infection plots, and a 12 replication row plot demonstration area

#### PROPOSED TREATMENT:

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PROPOSED YEARS OF ASSESSMENT:

PERMANENCY: 25 Years

#### ATTACHMENTS:

Trial Description Sheet

Trial Register Sheet

Stand Sheet

Trial Map

Single-tree-plot data for seedlot 4 blocks.



A7315

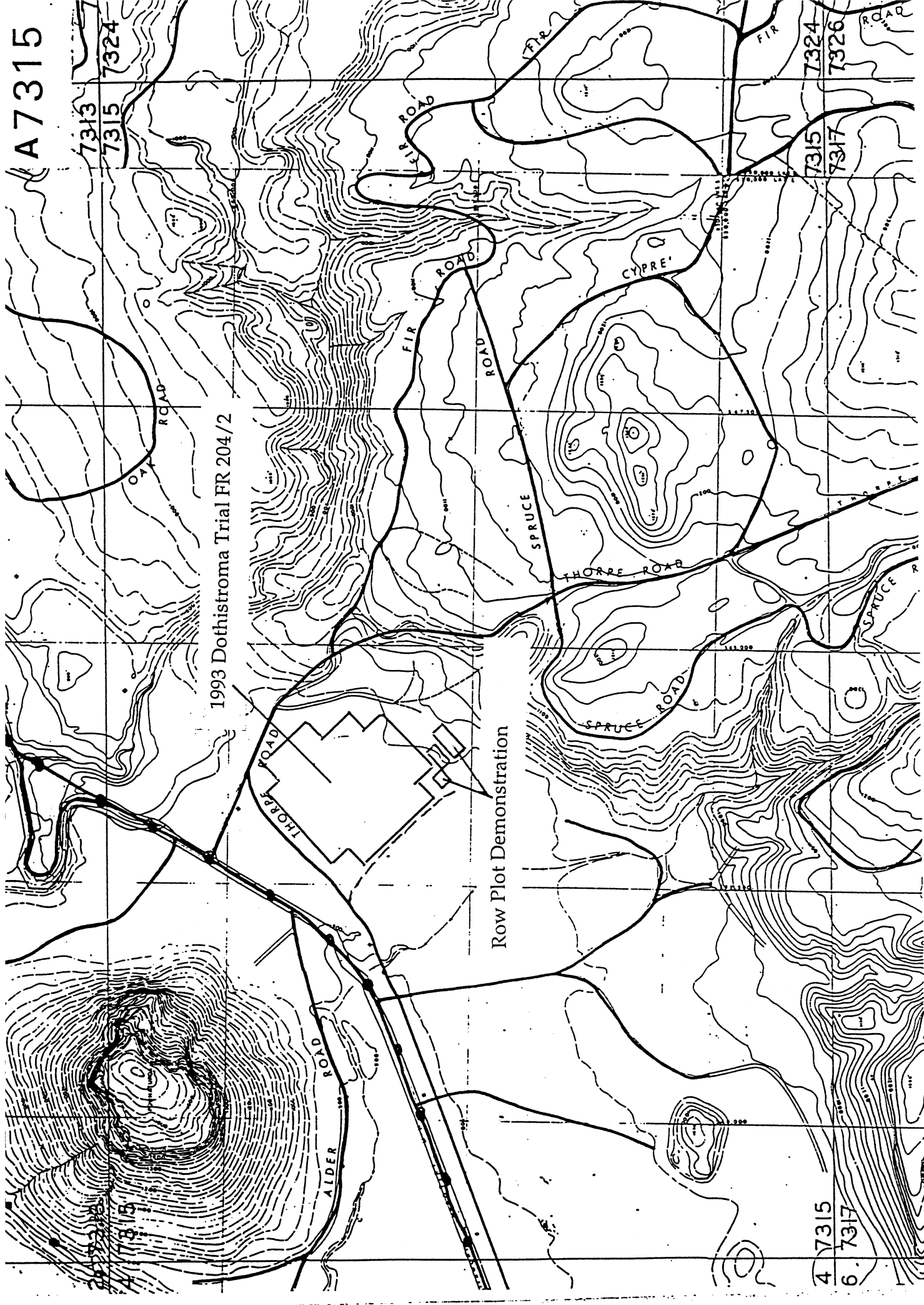
7313 7315 7324

7315 7317 7324 7326

1993 Dothistroma Trial FR 204/2

Row Plot Demonstration

4 7315  
6 7317



Map no 523

1993 Dothistroma Trial, Thorpe rd

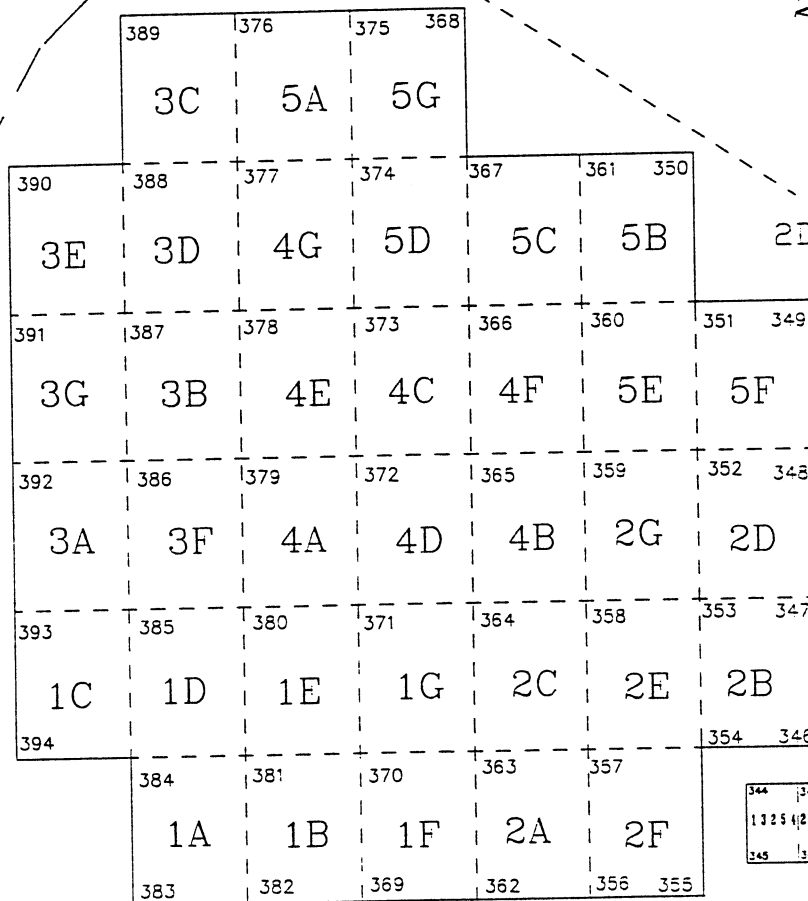
CHH Forests Ltd Kinleith

WP 1931 FR 204/2

Large plots  
3/B = rep 3,  
Seedlot B



Thorpe rd



2D = Rep, Treatment

Adjunct row  
Plot Experiment

|     |     |     |
|-----|-----|-----|
| 337 | 334 | 333 |
| 24  | 55  | 54  |
| 330 | 325 | 322 |
| 324 | 319 | 316 |
| 329 | 326 | 323 |
| 325 | 321 | 318 |
| 328 | 327 | 320 |

|     |     |     |
|-----|-----|-----|
| 336 | 337 | 332 |
| 132 | 134 | 131 |
| 339 | 338 | 335 |
| 324 | 323 | 321 |

|     |     |
|-----|-----|
| 344 | 343 |
| 132 | 135 |
| 345 | 342 |

3 = seedlot 3

0 50 100m  
Scale

1983 '880' Dothistroma trial  
RQ 1884/2

August 1993

FR 204/2  
 CHH Forests Thorpe Road, Atiamuri  
 STP Blocks Dothistroma Trial

1 D  
 385 380  
 2 1 1 2 2 2 2  
 3 1 2 3 2 3 1  
 3 2 3 2 1 3 1  
 3 2 1 3 3 1 2  
 3 2 1 3 1 1 3  
 3 2 1 3 3 1 1  
 3 2 2 1 2 3 1  
 384 381  
 2 D  
 352 348  
 1 2 2 3 2 3 1  
 2 1 1 2 2 1 1  
 1 1 1 3 2 3 2  
 3 3 3 1 3 3 3  
 2 1 2 1 3 1 2  
 2 1 2 3 3 1 1  
 2 2 3 3 1 2 3  
 353 347  
 3 D  
 388 377  
 3 2 3 3 2 3 2  
 1 3 3 2 2 3 1  
 1 2 3 3 1 2 2  
 1 3 3 1 2 3 3  
 1 1 3 1 1 2 2  
 1 2 3 1 2 2 1  
 1 3 1 1 2 2 2  
 387 378  
 4 D  
 372 365  
 1 1 1 2 3 1 2  
 1 3 2 3 2 1 3  
 3 1 2 3 3 0 0  
 3 3 2 1 3 1 1  
 3 1 3 2 1 1 1  
 3 1 2 3 3 2 3  
 2 1 2 2 2 2 1  
 371 364  
 5 D  
 374 367  
 1 2 1 3 3 3 3  
 1 1 3 1 3 3 3  
 3 1 1 1 1 2 1  
 1 2 3 3 2 3 2  
 1 2 2 2 2 3 3  
 1 1 2 2 2 2 2  
 373 366





|  |   |
|--|---|
|  | 3 |
|--|---|

|   |   |   |
|---|---|---|
| G | T | I |
|---|---|---|

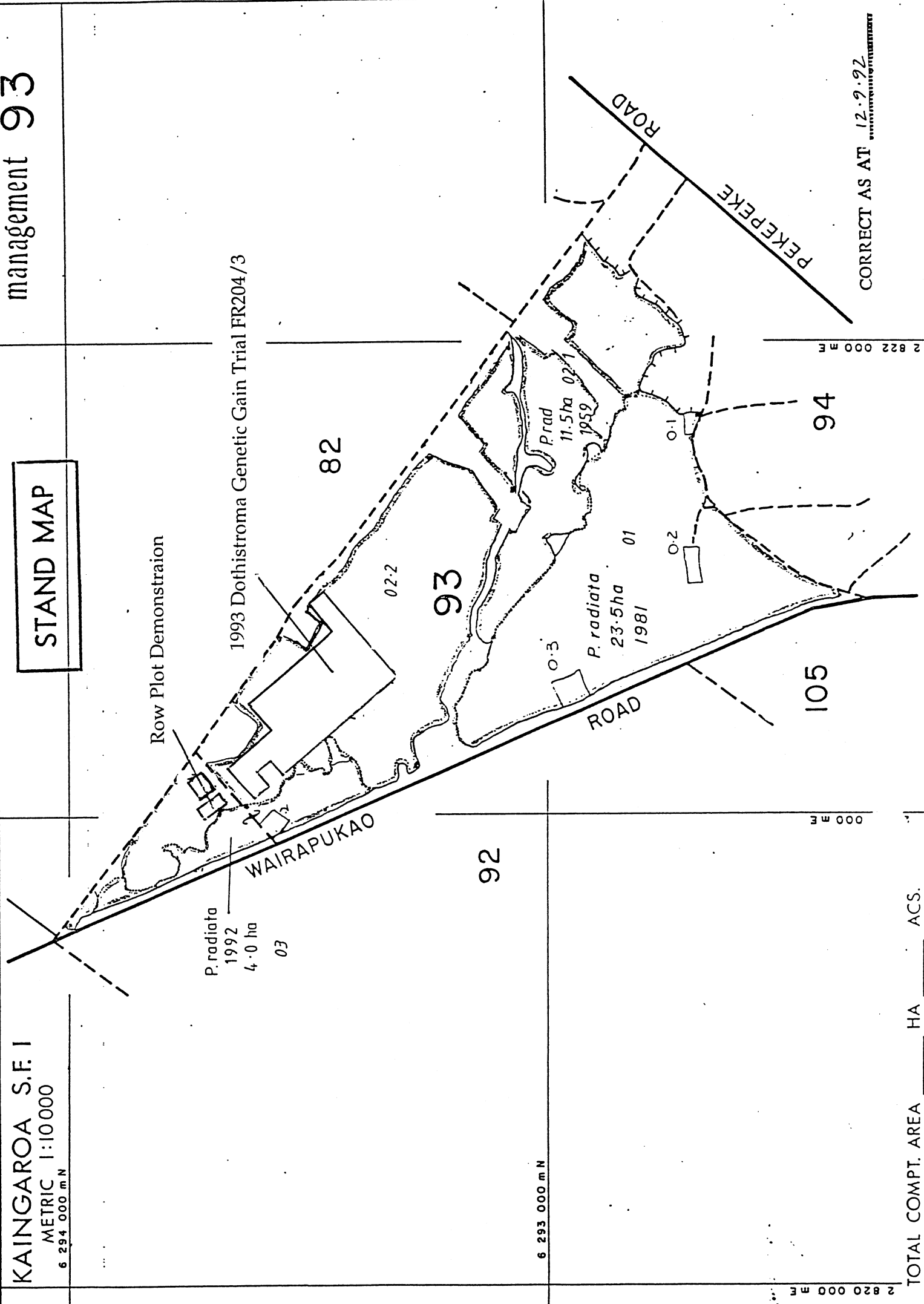
KAINGAROA S.F. I

METRIC 1:10000

6 294 000 m N

STAND MAP

management 93



CORRECT AS AT 12.9.92

TOTAL COMPT. AREA \_\_\_\_\_ HA \_\_\_\_\_ ACS.

# 1993 Dothistroma Trial

## Forestry Corporation of NZ

### Cpt 93 Kaingaroa FR 204/3

|       |         |
|-------|---------|
| 455   | 448 447 |
| 12354 | 51321   |
| 454   | 449 446 |
| 52314 | 24351   |
| 453   | 450 445 |
| 14532 | 23415   |
| 452   | 451 444 |

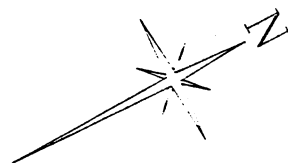
|         |       |       |
|---------|-------|-------|
| 441 440 | 435   | 434   |
| 54321   | 35214 | 34251 |
| 442 439 | 435   | 433   |
| 13425   | 35421 | 53412 |
| 443 438 | 437   | 432   |

Row plots  
3 = seedlot 3

Wairapukao Rd

Skid

Skid



|     |     |     |
|-----|-----|-----|
| 456 | 477 | 478 |
| 5A  | 5B  |     |
| 457 | 476 | 479 |
| 5G  | 5C  |     |
| 458 | 475 | 480 |
|     | 5D  |     |

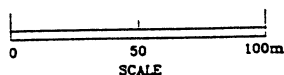
Large plots

2/B = rep 2

Seedlot B

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 459 | 474 | 481 | 496 | 498 |
| 5E  | 5F  | 4B  | 4E  |     |
| 460 | 473 | 482 | 495 | 499 |
| 4C  | 4D  | 4F  | 4A  |     |
| 461 | 472 | 483 | 494 | 500 |
| 4G  | 3A  | 3C  | 3G  |     |
| 462 | 471 | 484 | 493 | 210 |
| 3D  | 3E  | 3B  | 3F  |     |
| 463 | 470 | 485 | 492 | 221 |
| 2A  | 2D  | 2E  | 2C  |     |
| 464 | 469 | 486 | 491 | 222 |
| 2G  | 2F  | 2B  | 1C  |     |
| 465 | 468 | 487 | 490 | 223 |
| 1A  | 1B  | 1F  | 1E  | 1G  |
| 466 | 467 | 488 | 489 | 224 |
|     |     |     |     | 225 |
|     |     |     |     | 226 |
|     |     |     |     | 227 |
|     |     |     |     | 228 |

Skid



Skid

June 93

FR 204/3  
Kaingaroa Cpt.93  
STP Blocks for Dothi Trial

1 D  
226 227  
3 1 2 1 3 3 0  
1 2 2 3 1 1 2  
3 3 2 3 1 1 1  
3 3 2 1 2 2 2  
2 3 2 1 3 3 1  
1 1 2 3 2 1 3  
2 3 3 1 2 3 1  
225 228  
2 D  
470 485  
3 3 3 3 1 3 3  
2 1 1 1 2 2 2  
1 2 2 2 3 2 2  
3 1 3 3 1 3 3  
3 3 2 3 2 1 2  
2 2 1 1 1 1 1  
1 1 2 2 3 1 1  
469 486  
3 D  
462 471  
2 3 1 1 3 1 2  
1 3 1 2 1 1 2  
3 1 3 0 2 3 2  
1 1 2 2 1 2 2  
2 1 3 3 3 3 3  
3 1 2 3 2 2 1  
2 1 1 2 3 2 2  
463 470  
4 D  
473 482  
3 2 1 1 3 3 3  
0 1 1 1 3 2 1  
3 2 1 2 2 2 2  
3 2 1 1 3 2 3  
1 1 1 1 3 2 3  
3 2 1 3 1 2 2  
3 1 1 2 3 2 2  
472 483  
5 D  
475 480  
1 2 1 3 3 3 2  
1 2 1 3 3 3 2  
2 2 1 3 2 1 3  
1 3 1 3 2 2 3  
3 2 1 1 2 3 1  
1 1 2 1 3 2 2  
1 2 2 3 3 1 2  
474 481