

DOUGLAS-FIR

Cooperative

**ESTABLISHMENT REPORT FOR
THE 1996 DOUGLAS FIR SEED SOURCE
TRIALS AT SEVEN SITES**

G.T. STOVOLD

Report No. 21

January 1997



**NZ FRI/INDUSTRY
RESEARCH
COOPERATIVES**

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NZFRI/INDUSTRY RESEARCH COOPERATIVES

DOUGLAS-FIR COOPERATIVE

ESTABLISHMENT REPORT FOR THE 1996 DOUGLAS FIR SEED SOURCE TRIALS AT SEVEN SITES.

EXECUTIVE SUMMARY

During 1996 seven Seed source trials were established under Work Plan 2600 for the Douglas fir Breeding Cooperative, using seedlings grown from seed collected from California and Oregon in 1993 by C.B.Low and M.A.Miller (Low and Miller, 1994), and collections from all significant New Zealand Seed stands.

INTRODUCTION

Seed source trials for Douglas fir have been planted before(in 1971 and 1974), but these did not contain good coastal Californian seedlots, and the NZ seed stands of Californian origin were not in production at the time. With the estate of Douglas fir in New Zealand currently expanding, a number of factors recently combined to initiate a further series of seed source tests under the Douglas fir Cooperative. The factors were as follows :-

1. Seed collections had been just been made(1994) in all of the significant New Zealand seed stands
2. Seed was available from some coastal Californian seed orchards that had just come into production(1992/1993)
3. Seed from previously untested coastal California provenances was available
4. New classes of land are available for the large scale planting of Douglas fir
5. Weyerhaeuser were interested in trialing 12 seed orchard progenies on New Zealand sites

During 1996 seven genetic gain type trials were established under Work Plan 2600 for the Douglas fir Breeding Cooperative, using seedlings grown from seed collected from California and Oregon in 1993 by C.B.Low and M.A.Miller (Low and Miller, 1994), and collections from all significant New Zealand Seed stands.

OBJECTIVES

1. To test commercially available seedlots and Southern Californian provenance seedlots of Douglas fir on a variety of sites, from "typical" Douglas fir sites to "harsh" sites(Seedlots listed in Table 1).
2. Genetic gain comparison between seedlots in current use.
3. Provide for growth plot installation for long term information.

Table 1. SEEDLOT CODES (* denotes seedlots for big blocks)

Code	Seedlot	Source	Origin	seed zone	Latitude	Type of seed collection
*900	94/32	NZ Rotoehu 55	56/654 Ft. Bragg, California	94	39° 15'	Seed stand
901	94/33	NZ Kaingaroa 1132	R78/34 ex Rotoehu 55	94	39° 15'	Seed stand
902	94/128	NZ Kaingaroa 1061	R63/701, R64/734	?		Road edge
903	94/632	NZ Golden Downs 115	56/654 Ft. Bragg, California	94	39° 15'	Seed stand
*904	94/240	NZ Eyrewell, Main Race	Ashley (ex Coastal Oregon)	?		Seed stand
905	94/180	NZ Mount Thomas 1	Ashley (ex Coastal Oregon)	?		Seed stand
*906	93/677	NZ Beamont, Tramway	Washington ?	?		Seed stand
907		US Louisiana Pacific	Humboldt County, California	92	40° 59'	Seed Orchard
808		US Los Padres N. F.	Monterey County, California	130	35° 49'	Native forest
809		US San Francisco W.R.	San Mateo County, California	97	37° 27'	Native forest
810		US Cascade Ranch	Santa Cruz County, California	97	37° 08'	Native forest
811		US Point Reyes N. S.	Marin County, California	96	38° 04'	Native forest
812		US S. P. Taylor S. Park	Marin County, California	96	38° 02'	Native forest
813		US Russian River	Sonoma County, California	96	38° 25'	Native forest
814		US Fort Ross S. Park	Sonoma County, California	95	38° 31'	Native forest
815		US Gualala	Mendocino County, California	95	38° 47'	Native forest
816		US Navarro River	Mendocino County, California	95	39° 11'	Native forest
817		US Noyo River	Mendocino County, California	94	39° 25'	Native forest
818		US Rockport	Mendocino County, California	94	39° 41'	Native forest
819		US Georgia Pacific	Mendocino County, California	94	39° 25'	Seed Orchard
122		US Weyerhaeuser #1	Coos Bay, Oregon		43° 20'	S. O. progeny
222		US Weyerhaeuser #2	Coos Bay, Oregon		43° 20'	S. O. progeny
322		US Weyerhaeuser #3	Coos Bay, Oregon		43° 20'	S. O. progeny
422		US Weyerhaeuser #4	Coos Bay, Oregon		43° 20'	S. O. progeny
123		US Weyerhaeuser #1	Long View, Washington		46° 30'	S. O. progeny
223		US Weyerhaeuser #2	Long View, Washington		46° 30'	S. O. progeny
323		US Weyerhaeuser #3	Long View, Washington		46° 30'	S. O. progeny
423		US Weyerhaeuser #4	Long View, Washington		46° 30'	S. O. progeny
124		US Weyerhaeuser #1	Twin Harbours, Washington		48° 05'	S. O. progeny
224		US Weyerhaeuser #2	Twin Harbours, Washington		48° 05'	S. O. progeny
324		US Weyerhaeuser #3	Twin Harbours, Washington		48° 05'	S. O. progeny
424		US Weyerhaeuser #4	Twin Harbours, Washington		48° 05'	S. O. progeny
825	94/709	US Simpsons Timber	Humboldt County, California	91, 92	40°	Seed Orchard
826†		US Siuslaw Forest	Lane County, Oregon	61	44° 10'	Native forest
827†		US Umpqua River	Douglas County, Oregon	71	43° 34'	Native forest
828†		US Willamette Forest	Lane County, Oregon	262	43° 50'	Native forest
908		Mix of codes 900 and 906				

† seedlots planted at Tauhara only, see appendix I for makeup

DESIGN

Randomised complete block design

10 replications

33 seedlots per replication

3 x 11 rows of 5-tree row plots per replication

spacing 3 x 3m (1111 stems per hectare)

Two replications of three New Zealand seedlots as 49 tree plots (for long term yield studies)

SITE ACQUISITION

The process of acquiring and laying out of the trials began in January with an request made to Co-operators for suitable uniform sites, in the regions nominated by the Cooperative. All prospective sites were visited and the best of those offered were put on a 'short list' for approval by Cooperative members

FIELD LAYOUT

A sufficient number of replications was laid out using a theodolite and measuring tape, leaving out areas of the site which appeared to be significantly different from the rest of the site. Replications 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'.

NURSERY SEEDLING SURVIVAL COUNTS/LABELLING

During April 1996 seedling survival was assessed 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 that while most seedlots had produced sufficient seedlings, there would need to be some adjustments to seedlots by site to ensure all seedlots were tested on at least one site.

TRIAL LIFTING

Lifting and sorting of each trial was begun in the week before field establishment. Where a seedlots fell short of the 50 plants required for site, the seedlot was made up to the nearest replication,(eg 40 plants = 8 reps), and another seedlot (Code 908) substituted for the remaining replications.

TRIAL ESTABLISHMENT/PLOT MAPPING

The trees 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 bag of trees was brought to the pegged plot about to be planted. Bundles of five trees were given randomly to the planters. Planting strings guide planters to produce accurate planting spacing, (3m x 3m). Map position of seedlots after the plot is planted. Repeat until all plots planted.

SITES PLANTED

FR281/1 Cpt 247 Golden Downs Forest, Fletcher Challenge Forests Ltd

FR281/2 Cpt 521 Tauhara Forest, Fletcher Challenge Forests Ltd

FR281/3 Cpt 13 Hanmer Forest, Carter Holt Harvey Ltd

FR281/4 Cpt 8/15 Waipouri Forest, City Forests Ltd

FR281/5 Ribbonwood Station, NZFRI, Colin McKai

FR281/6 Cpt 746 Gowan Hills, Earnslaw One Ltd (6 replications only)

FR281/7 Cpt 27 Beaumont, Earnslaw One Limited (6 replications only)

A description of each site is provided in appendix II

CONCLUSION

The trials were successfully established. Some of the planting stock used could be considered as small when compared to normal planting stock, but given that it is likely that many of the Californian seedlots have some degree of inbreeding, a wide range of plant vigour could be expected.

REFERENCES

Low, C.B.;Miller M.A. 1994: Selection and seed collection for the NZ Breeding Population of Douglas-fir from stands in California and Oregon. Douglas-fir Cooperative Report No.3.

Appendix 1 Makeup of Tauhara seedlots

Code	Provenance	A	B	C	D	E	F	G
826	Siuslaw Forest	-	-	-	363,371	372,381	365	-
827	Umpqua River	335	342	-	345,353	-	339	-
828	Willamette Forest	382	386	-	-	-	383	384,391

10 seedling from each code

SUB EXPT.:	1
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Purpose: (100 characters maximum)

[illegible]

P	S	M	E	N

[illegible]

Related Programs					

[illegible]

TRIAL DESCRIPTION SHEET

FOREST OWNER: FLETCHER CHALLENGE
FORESTS LTD

EXPT. No.: FR281/1

FOREST: GOLEN DOWNS

CPT.: 247

CONTACT PERSON: MARK BRYANT

PHONE: 03 572 8963

FAX: 03 572 8953

CONTROLLING AGENCY: GTI

WORK PLAN #: 2600

PROJECT: 42/15

FRI CORR. File:

PURPOSE: Douglas Fir Seed Source and Provenance Study

SITE DETAILS:

LATITUDE: 41°30'

LONGITUDE: 172°42'

ALTITUDE: 370

ASPECT: N, NE

SLOPE: 5-25°

GROUND PREPARATION:

SOIL TYPE:

PREVIOUS USE: ex forest plantation

EXPERIMENTAL DETAILS:

SPECIES: Ps. Menziesii

STOCK: 1½/0

DATE PLANTED: 8/96

OF PLOTS: 30

SIZE OF PLOTS: 33m x 15m

SPACING: 3m x 3m

TOTAL AREA: 1.48ha

DEMARCATIION: Numbered posts

EXPERIMENTAL DESIGN:

33 Seedlots, 10 replications of 5 tree row plots

PROPOSED TREATMENT:

PROPOSED YEARS OF ASSESSMENT: 2004, 2011

PERMANENCY: 30 years

ATTACHMENTS:

Stand Sheet
Trial map

1996 Douglas Fir Seed Source Test FR281/1

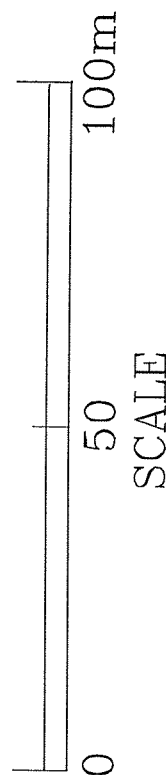
cpt 247 Golden Downs

Large Plots of NZ Material
900 = 94/32 Rotoehu cpt 55
904 = 94/240 Eyrewell, Main Race
906 = 94/180 Beaumont, Tramway

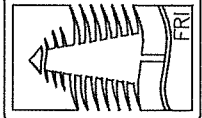
229	900	230	904	231	232
228	906	227	900	226	225
221		222		223	224

7	8	21	22	35	36	49
6	9	20	23	34	37	48
5	10	19	24	33	38	47
4	11	18	25	32	39	46
3	12	17	26	31	40	45
2	13	16	27	30	41	44
1	14	15	28	29	42	43

Tree Position

[illegible]

McIntyres rd No 62



Genetics and Tree Improvement

Phone (07) 3475899

Trial Number FR281/1

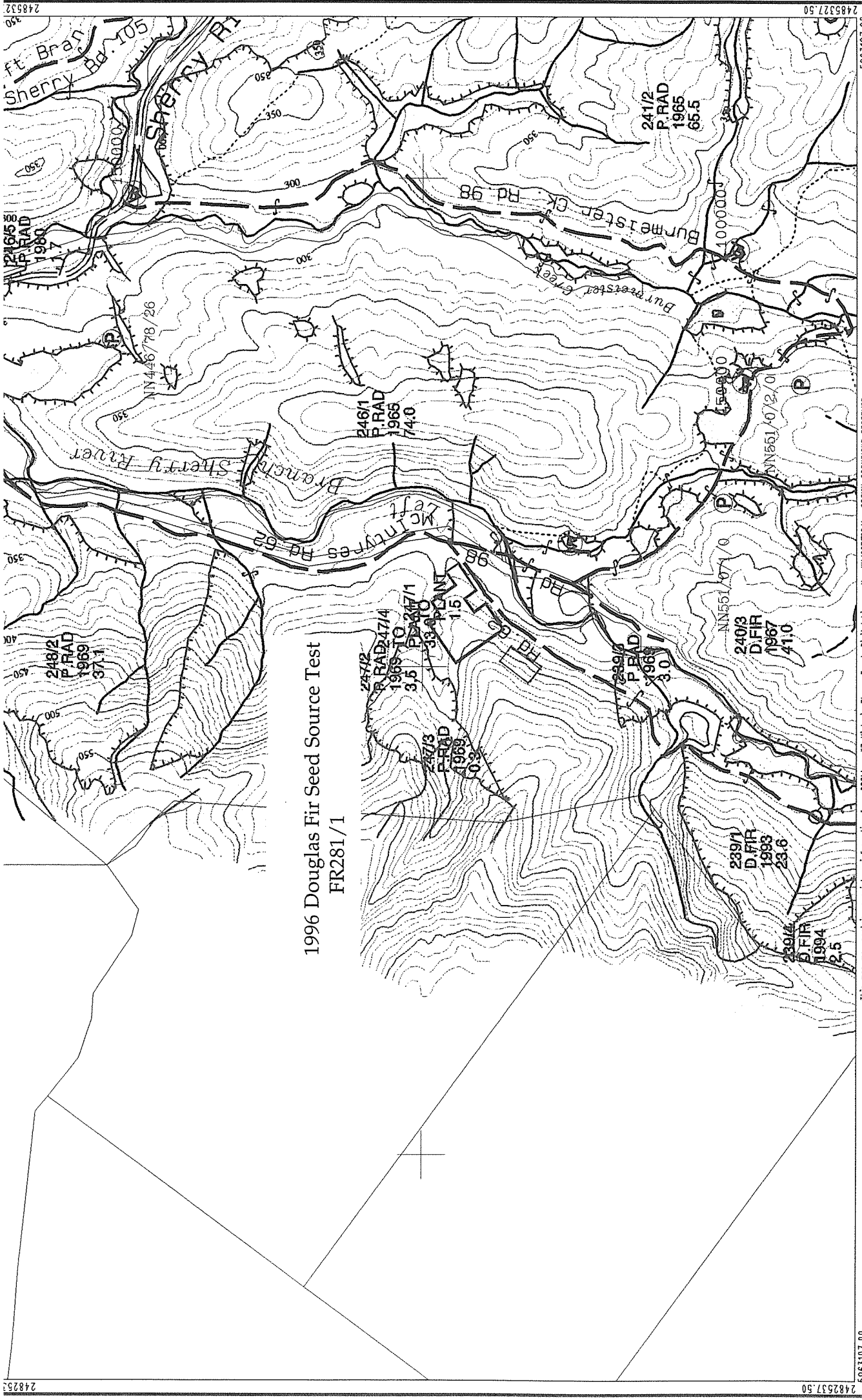
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Drawn by G. T. STOVOLD

Date 26/9/96

248537.50

248537.50



1996 Douglas Fir Seed Source Test
FR281/1

248537.50

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5963107.00
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5963107.00

Scale 1:10000
Contour Interval 10M

GDNS 247 - TRIAL

FLETCHER
CHALLENGE
FORESTS



2

DOUGLAS FIR SEED SOURCE AND PROVENANCE STUDY

P	S	M	E	N

[illegible]

Contact Officer:

Related Programs				

TRIAL DESCRIPTION SHEET

FOREST OWNER: FLETCHER CHALLENGE
FORESTS LTD

EXPT. No.: FR281/2

FOREST: TAUHARA

CPT.: 521

CONTACT PERSON: MARK BRYANT

PHONE: 03 572 8963

FAX: 03 572 8953

CONTROLLING AGENCY: GTI

WORK PLAN #: 2600

PROJECT: 42/15

FRI CORR. File:

PURPOSE: Douglas Fir Seed Source and Provenance Study

SITE DETAILS:

LATITUDE: 38°41'

LONGITUDE: 176°12'

ALTITUDE: 500M

ASPECT: NE

SLOPE: 10°

GROUND PREPARATION:

SOIL TYPE:

PREVIOUS USE: Forest Plantation

EXPERIMENTAL DETAILS:

SPECIES: Ps. Menziesii **STOCK:** 1½/0 **DATE PLANTED:** 8/96

OF PLOTS: 30 **SIZE OF PLOTS:** 33m x 15m **SPACING:** 3m x 3m

TOTAL AREA: 1.48ha **DEMARCATATION:** Numbered posts

EXPERIMENTAL DESIGN:

33 Seedlots, 10 replications of 5 tree row plots

PROPOSED TREATMENT:

PROPOSED YEARS OF ASSESSMENT: 2004, 2011

PERMANENCY: 30 years

ATTACHMENTS:

Stand Sheet

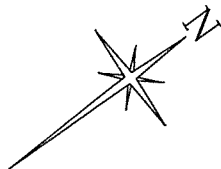
Trial map

7	8	21	22	35	36	49
6	9	20	23	34	37	48
5	10	19	24	33	38	47
4	11	18	25	32	39	46
3	12	17	26	31	40	45
2	13	16	27	30	41	44
1	14	15	28	29	42	43

330	900	329	906	324	323
331	906	328	904	325	322
332		327		326	

Large Plots of NZ Material
900 = 94/32 Rotoehu cpt 55
904 = 94/240 Eyrewell, Main Race
906 = 94/180 Beaumont, Tramway

→ N C A G
Within row
tree position

[illegible]

Track

To Puerto Valley rd

100m

05

SCALE

Genetics and Tree Improvement

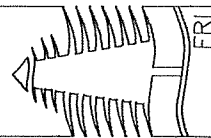
Phone (07) 9475899

Trial Number FR281/2

Map Number 567

Drawn by G.T.STOVOLD

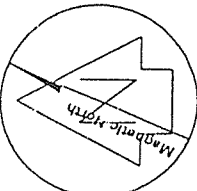
Date 26/9/96



RI



17-JAN-1996



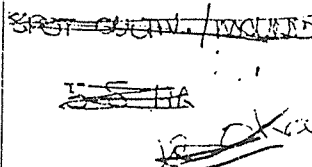
Registration

x1: 2786560

y1: 6274905

x2: 2789100

y2: 6276535



Scale

1:10000

C.I. 500

5M

U18/4.1

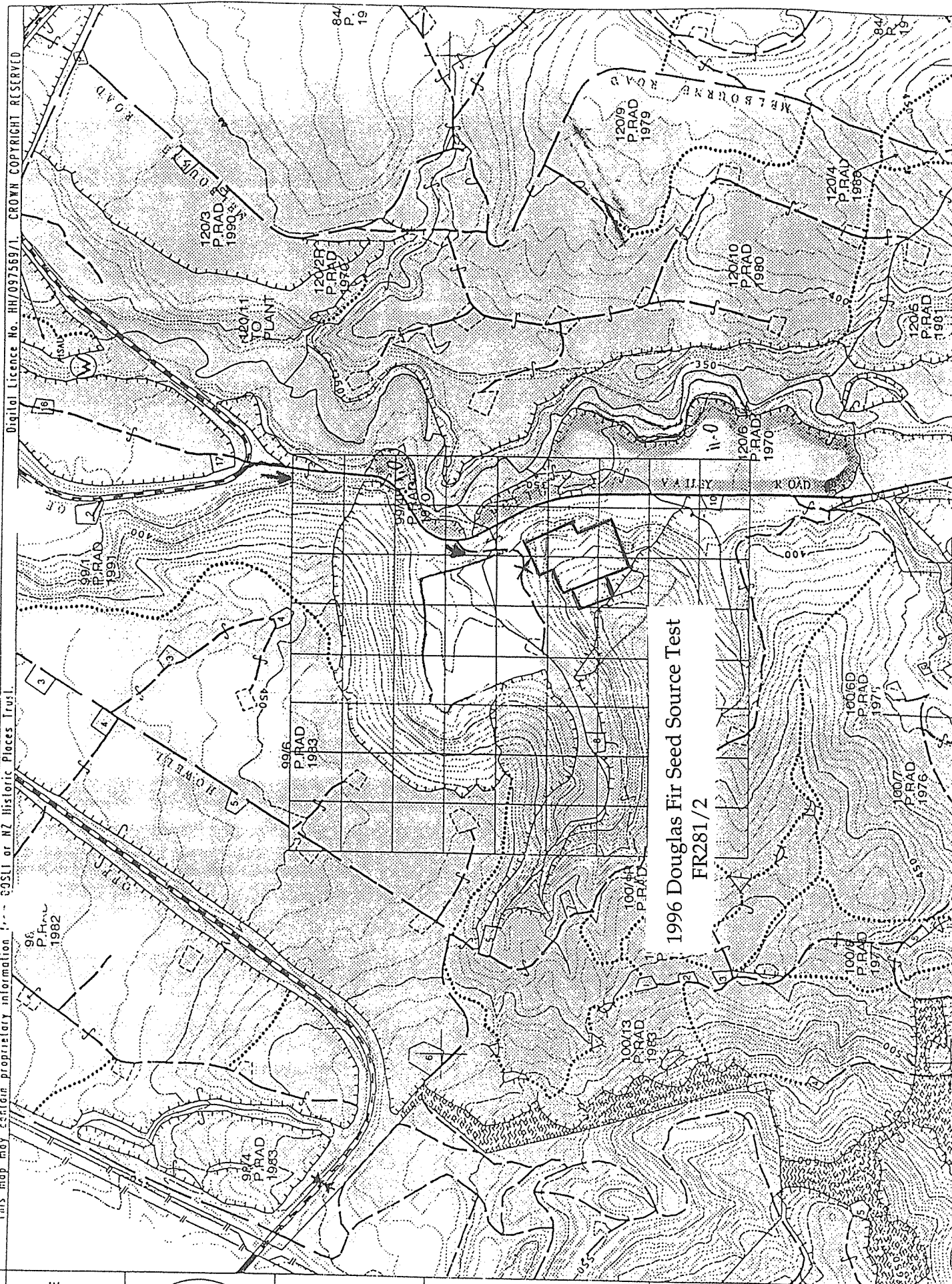
521
TAUHARA

24.5 ha
CUTOVER PLANN
FOR PLANTING

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1996 Douglas Fir Seed Source Test
FR281/2



TRIAL DESCRIPTION SHEET

FOREST OWNER: CARTER HOLT HARVEY
FORESTS LTD

EXPT. No.: FR281/3

FOREST: HANMER

CPT.: 25

CONTACT PERSON: EDWIN MIDDLEKOOP

PHONE: 03 313 8015

FAX: 03 313 4090

CONTROLLING AGENCY: GTI

WORK PLAN #: 2600

PROJECT: 42/15

FRI CORR. File:

PURPOSE: Douglas Fir Seed Source and Provenance Study

SITE DETAILS:

LATITUDE: 41°34'

LONGITUDE: 172°52'

ALTITUDE: 500

ASPECT: N

SLOPE: 10°

GROUND PREPARATION:

SOIL TYPE:

PREVIOUS USE: Forest plantation

EXPERIMENTAL DETAILS:

SPECIES: Ps. Menziesii **STOCK:** 1½/0 **DATE PLANTED:** 8/96

OF PLOTS: 30 **SIZE OF PLOTS:** 33m x 15m **SPACING:** 3m x 3m

TOTAL AREA: 1.48ha **DEMARICATION:** Numbered posts

EXPERIMENTAL DESIGN:

33 Seedlots, 10 replications of 5 tree row plots

PROPOSED TREATMENT:

PROPOSED YEARS OF ASSESSMENT: 2004, 2011

PERMANENCY: 30 years

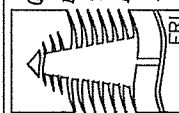
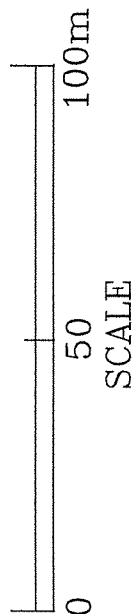
ATTACHMENTS:

Stand Sheet
Trial map

FR281/3 cpt 25 Hammer

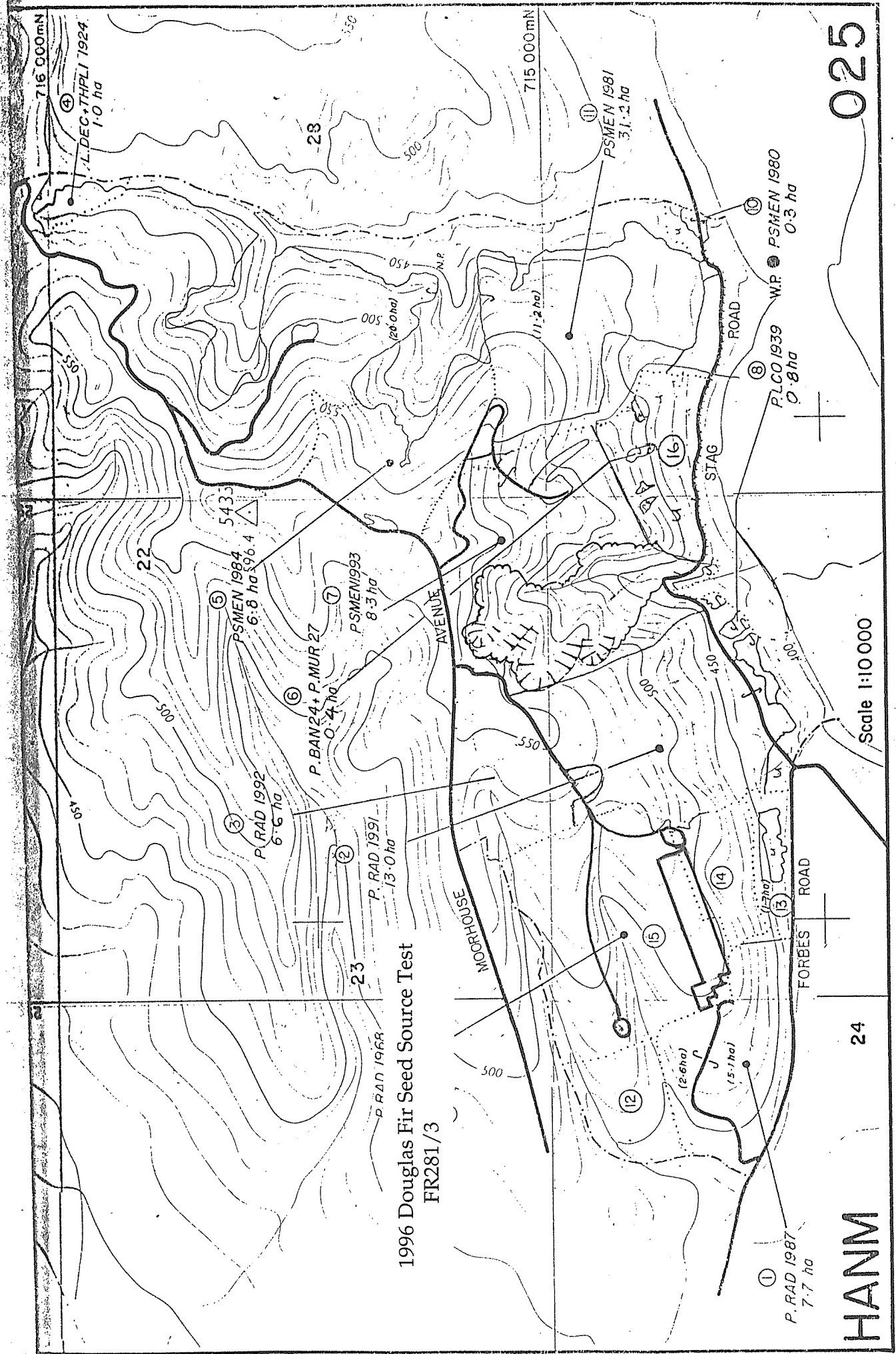
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Large Plots of NZ Material
 9900 = 94/32 Rotoehu cpt 55
 9904 = 94/240 Eyrewell, Main Race
 9906 = 94/180 Beaumont, Tramway



Genetics and Tree Improvement
Phone (07)8475899
Trial Number FR281/3
Map Number 568
Drawn by G.T.STOVOLD
Date 26/9/96

700 Summer



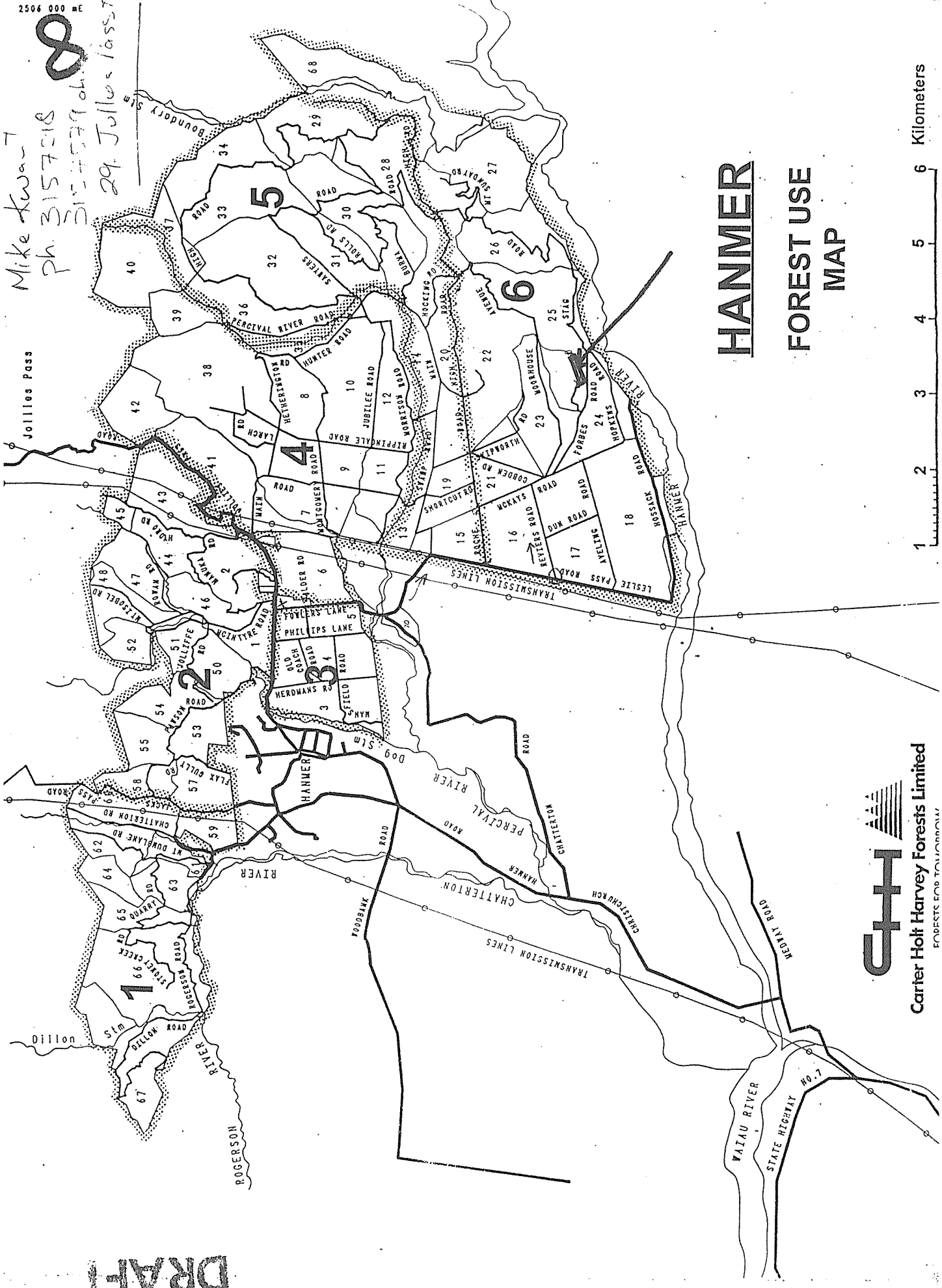
DRAFT

2506 000 ME

Mike Kwan
ph. 3157218
315-5579

8

29. Jullies Pass



HANMER

FOREST USE MAP



Carter Holt Harvey Forests Limited
FORESTS AND TIMBER

TRIAL DESCRIPTION SHEET

FOREST OWNER: CITY FORESTS LTD**EXPT. No.:** FR281/4**FOREST:** WAIPOURI**CPT.:** 8/15**CONTACT PERSON:** PHIL TAYLOR**PHONE:** 03 455 5512**FAX:** 03 455 5501**CONTROLLING AGENCY:** GTI**WORK PLAN #:** 2600**PROJECT:** 42/15**FRI CORR. File:****PURPOSE:** Douglas Fir Seed Source and Provenance Study

SITE DETAILS:**LATITUDE:** 45° 52'**LONGITUDE:** 169° 58'**ALTITUDE:** 300m**ASPECT:** NW**SLOPE:** 0 -10°

GROUND PREPARATION: Spot ripper/mounded

SOIL TYPE:

PREVIOUS USE: Forest Plantation

EXPERIMENTAL DETAILS:**SPECIES:** Ps. Menziesii **STOCK:** 1½/0 **DATE PLANTED:** 8/96**# OF PLOTS:** 30 **SIZE OF PLOTS:** 33m x 15m **SPACING:** 3m x 3m**TOTAL AREA:** 1.48ha **DEMARICATION:** Numbered posts

EXPERIMENTAL DESIGN:33 Seedlots, 10 replications of 5 tree row plots

PROPOSED TREATMENT:**PROPOSED YEARS OF ASSESSMENT:** 2004, 2011**PERMANENCY:** 30 years

ATTACHMENTS:

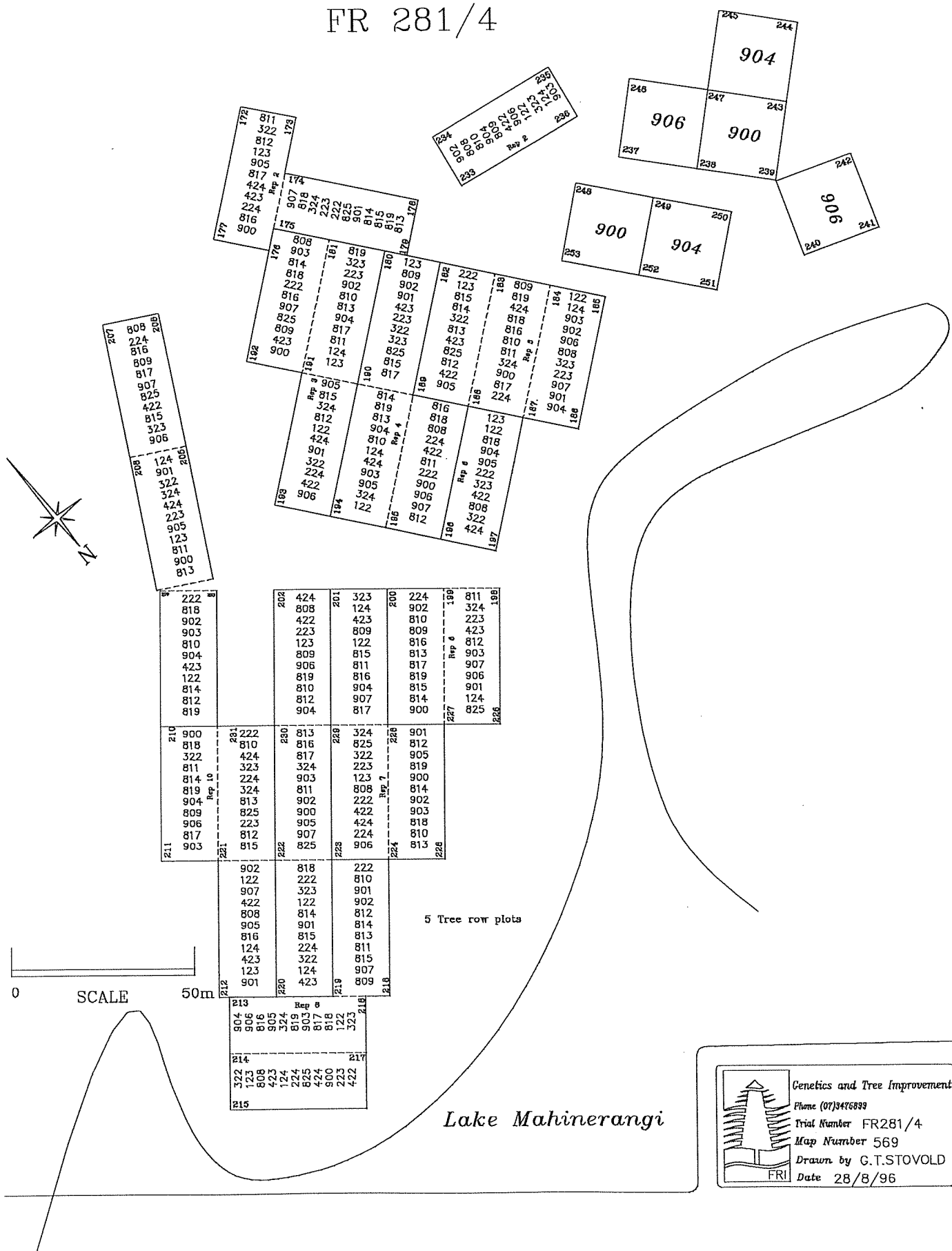
Stand Sheet

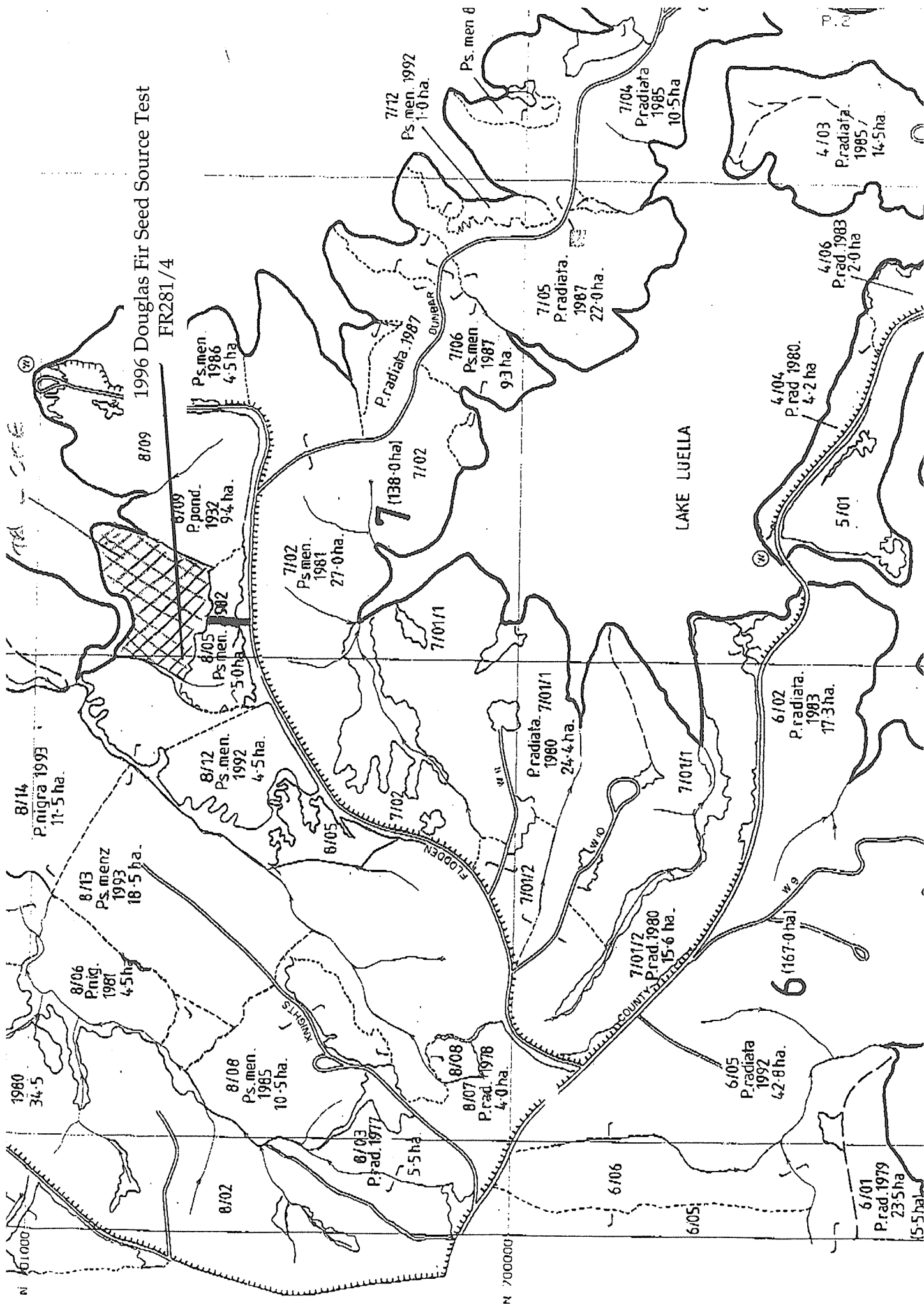
Trial map

1996 Douglas Fir Seed Source Trial

Waipouri Forest, cpt 8/15, City Forests Ltd

FR 281/4





	5
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Purpose: (100 characters maximum)

DOUGLAS FIR SEED SOURCE AND PROVENANCE STUDY

P	S	M	E	N

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

[illegible]

Experiment Start yr.	Current Plots	Plots Terminated	Control Agency	FRI related Projects	FRI WP/no.
1996					2600

Related Programs					

Contact Officer:

[illegible]

TRIAL DESCRIPTION SHEET

FOREST OWNER: COLIN MCKAI**EXPT. No.:** FR281/5**FOREST:** RIBBONWOOD STATION**CPT.:****CONTACT PERSON:** NICK LEDGARD**PHONE:** 03 313 8053**FAX:** 03 313 8051**CONTROLLING AGENCY:** GTI**WORK PLAN #:** 2600**PROJECT:** 42/15**FRI CORR. File:****PURPOSE:** Douglas Fir Seed Source and Provenance Study

SITE DETAILS:**LATITUDE:** 43° 24'**LONGITUDE:** 169° 50'**ALTITUDE:** 600m**ASPECT:** S**SLOPE:** 15 -25m

GROUND PREPARATION:**SOIL TYPE:****PREVIOUS USE:** ex Farmland

EXPERIMENTAL DETAILS:**SPECIES:** Ps. Menziesii **STOCK:** 1½/0 **DATE PLANTED:** 8/96**# OF PLOTS:** 30 **SIZE OF PLOTS:** 33m x 15m **SPACING:** 3m x 3m**TOTAL AREA:** 1.48ha **DEMARCATIION:** Numbered posts

EXPERIMENTAL DESIGN:33 Seedlots, 10 replications of 5 tree row plots

PROPOSED TREATMENT:**PROPOSED YEARS OF ASSESSMENT:** 2004, 2011**PERMANENCY:** 30 years

ATTACHMENTS:

Stand Sheet

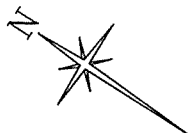
Trial map

[illegible]

Matagouri

1983 trial area

Matagouri



To Homestead

Stream,

Large Flots of NZ Material
 000 - 94/32 Rotochu cpt 55
 004 - 94/240 Eyrewell, Main Race
 006 - 94/180 Beaumont, Tramway

Tree Position

SCALE



Genetics and Tree Improvement

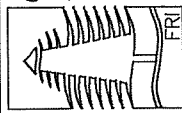
Phone (07) 9495899

Trial Number FR281/5

Map Number 570

Drawn by G.T.STOVOLD

Date 27/9/96



TRIAL DESCRIPTION SHEET

FOREST OWNER: EARNSLAW ONE LTD**EXPT. No.:** FR281/6**FOREST:** GOWAN HILLS**CPT.:** 746**CONTACT PERSON:** PHIL DE LA MERE**PHONE:** 03 204 8061**FAX:** 03 204 8067**CONTROLLING AGENCY:** GTI**WORK PLAN #:** 2600**PROJECT:**

42/15

FRI CORR. File:**PURPOSE:** Douglas Fir Seed Source and Provenance Study

SITE DETAILS:**LATITUDE:** 45°55'**LONGITUDE:** 168v9'**ALTITUDE:** 630m**ASPECT:** W**SLOPE:** 10°

GROUND PREPARATION:**SOIL TYPE:****PREVIOUS USE:** Ex Farmland

EXPERIMENTAL DETAILS:**SPECIES:** Ps. Menziesii**STOCK:** 1½/0**DATE PLANTED:** 8/96**# OF PLOTS:** 30**SIZE OF PLOTS:** 33m x 15m**SPACING:** 3m x 3m**TOTAL AREA:** 1.48ha**DEMARCATIION:** Numbered posts

EXPERIMENTAL DESIGN:

33 Seedlots, 10 replications of 5 tree row plots

PROPOSED TREATMENT:**PROPOSED YEARS OF ASSESSMENT:**

2004, 2011

PERMANENCY:

30 years

ATTACHMENTS:

Stand Sheet

Trial map

GUWAN HILL

740

741

MAD RIVER RD.

742

1996 Douglas Fir Seed Source Test
FR281/6

13 ha

BUSH = 21.8 ha

745

TOTAL AREA = 226.5 ha

737

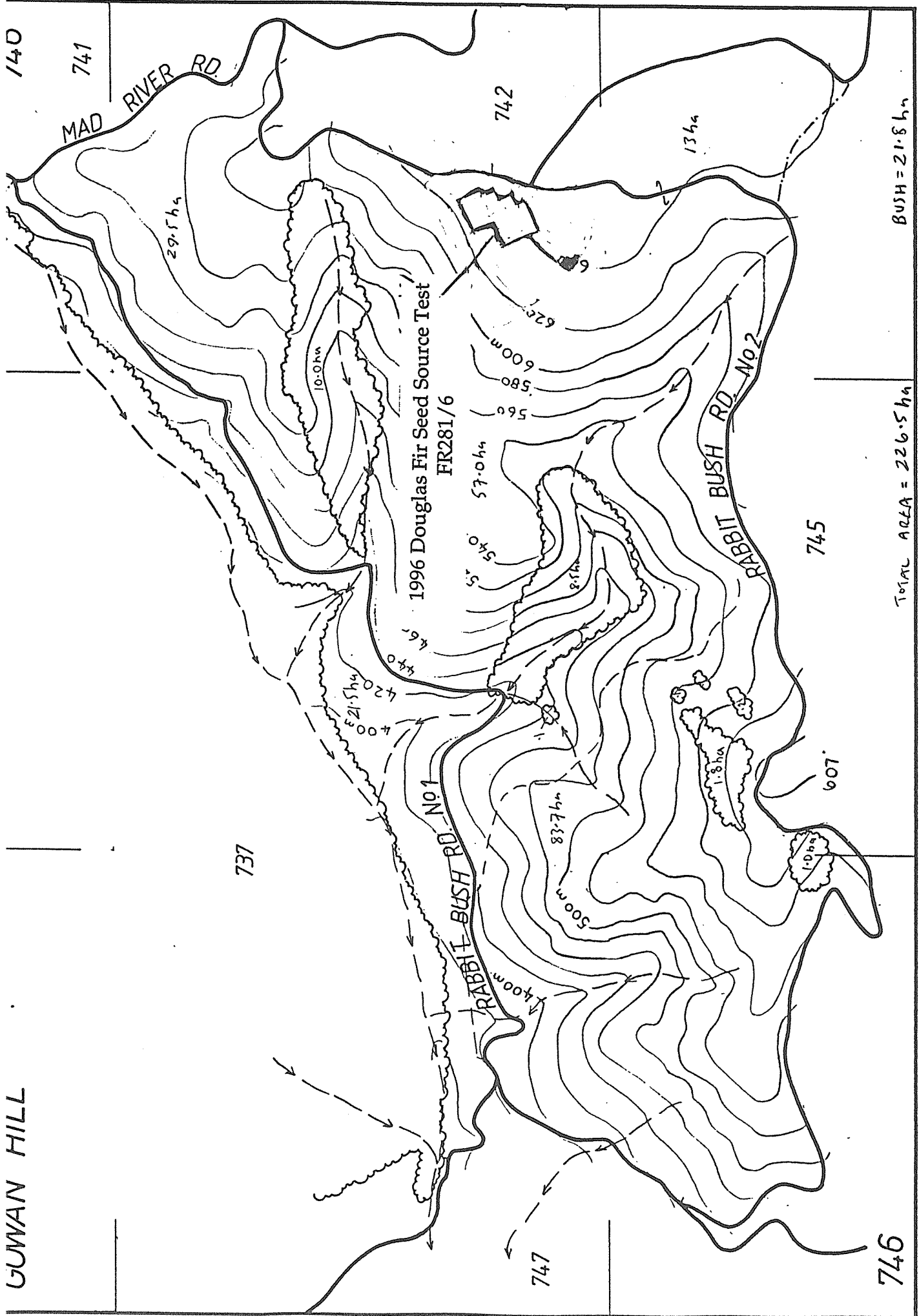
RABBIT BUSH RD. No 1

RABBIT BUSH RD. No 2

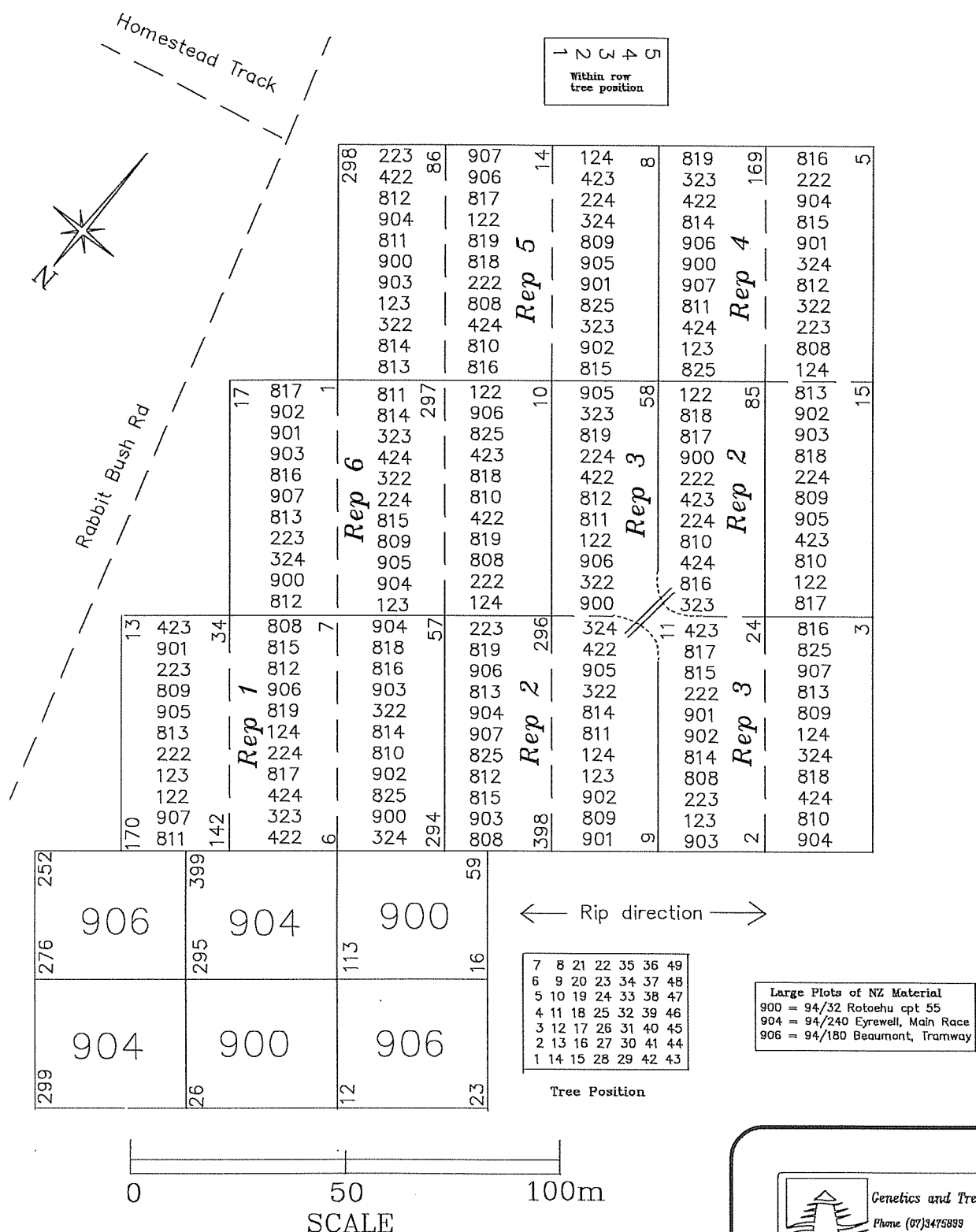
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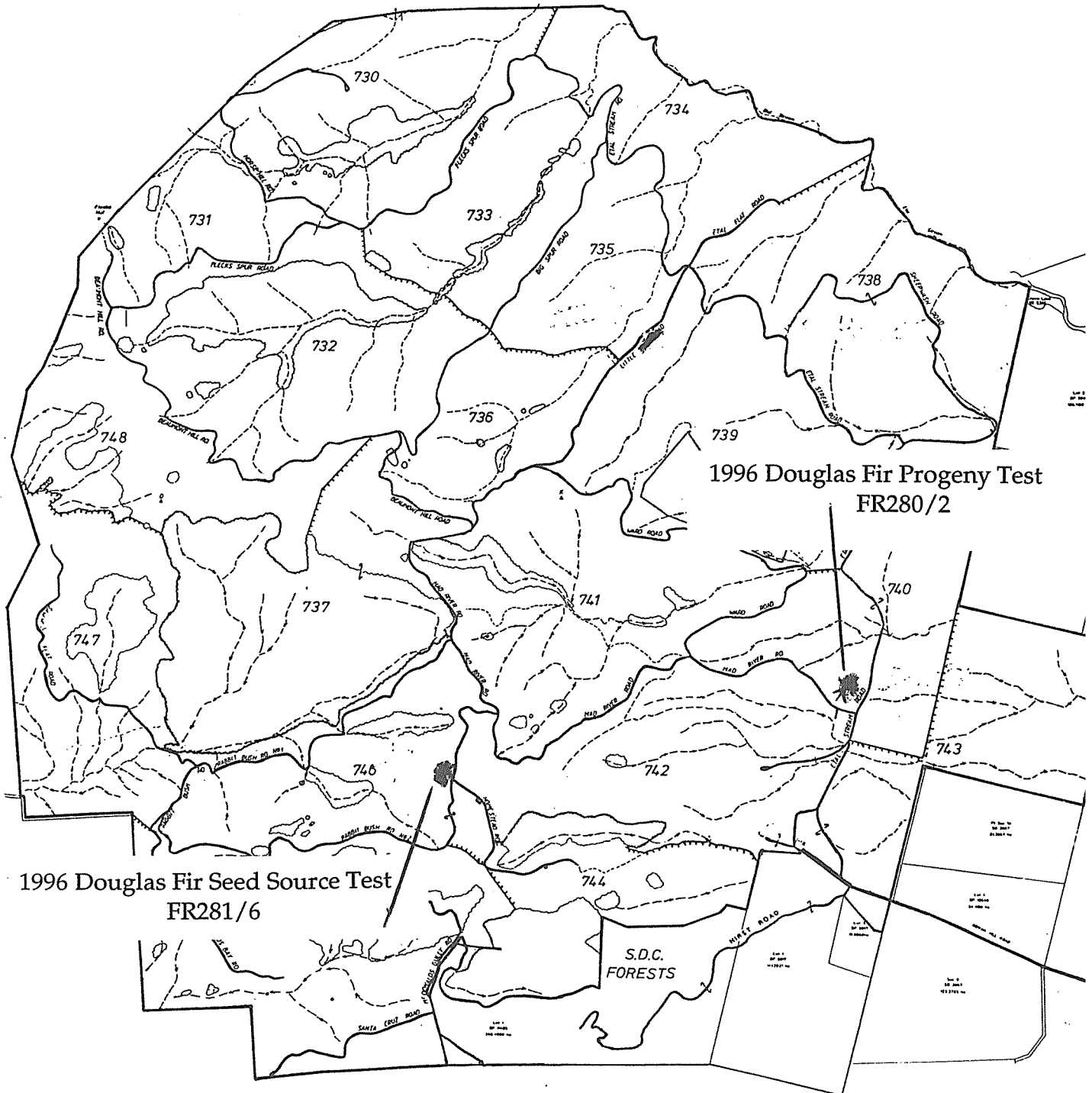
746

747



1996 Douglas Fir Seed Source Test FR281/6 Cpt 746 Gowan Hills Forest





GOWAN HILL FOREST MAP

0 1 2km
SCALE 1:30 000



ERNSLAW ONE
LIMITED

TRIAL DESCRIPTION SHEET

FOREST OWNER: EARNSLAW ONE LTD**EXPT. No.:** FR281/7**FOREST:** BEAUMONT**CPT.:** 27**CONTACT PERSON:** PHIL DE LA MERE**PHONE:** 03 204 8061**FAX:** 03 204 8067**CONTROLLING AGENCY:** GTI**WORK PLAN #:** 2600**PROJECT:** 42/15**FRI CORR. File:****PURPOSE:** Douglas Fir Seed Source and Provenance Study

SITE DETAILS:**LATITUDE:** 46°39'**LONGITUDE:** 169°30'**ALTITUDE:** 430m**ASPECT:** NE**SLOPE:** 5°**GROUND PREPARATION:** Spot ripper/mounded**SOIL TYPE:****PREVIOUS USE:** Forest Plantation

EXPERIMENTAL DETAILS:**SPECIES:** Ps. Menziesii **STOCK:** 1½/0 **DATE PLANTED:** 8/96**# OF PLOTS:** 30 **SIZE OF PLOTS:** 33m x 15m **SPACING:** 3m x 3m**TOTAL AREA:** 1.48ha **DEMARCATATION:** Numbered posts

EXPERIMENTAL DESIGN:

33 Seedlots, 10 replications of 5 tree row plots

PROPOSED TREATMENT:**PROPOSED YEARS OF ASSESSMENT:** 2004, 2011**PERMANENCY:** 30 years

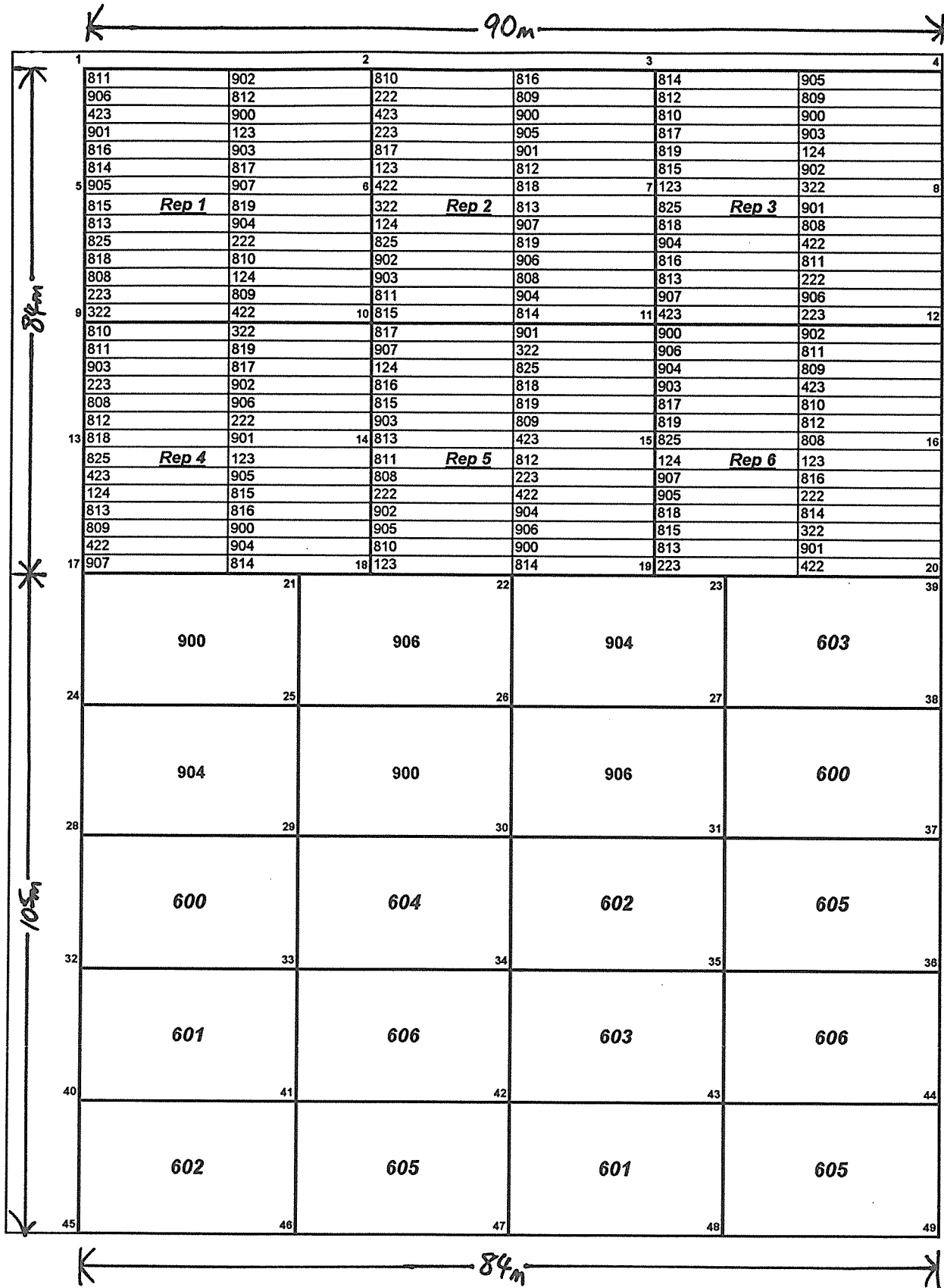
ATTACHMENTS:

Stand Sheet

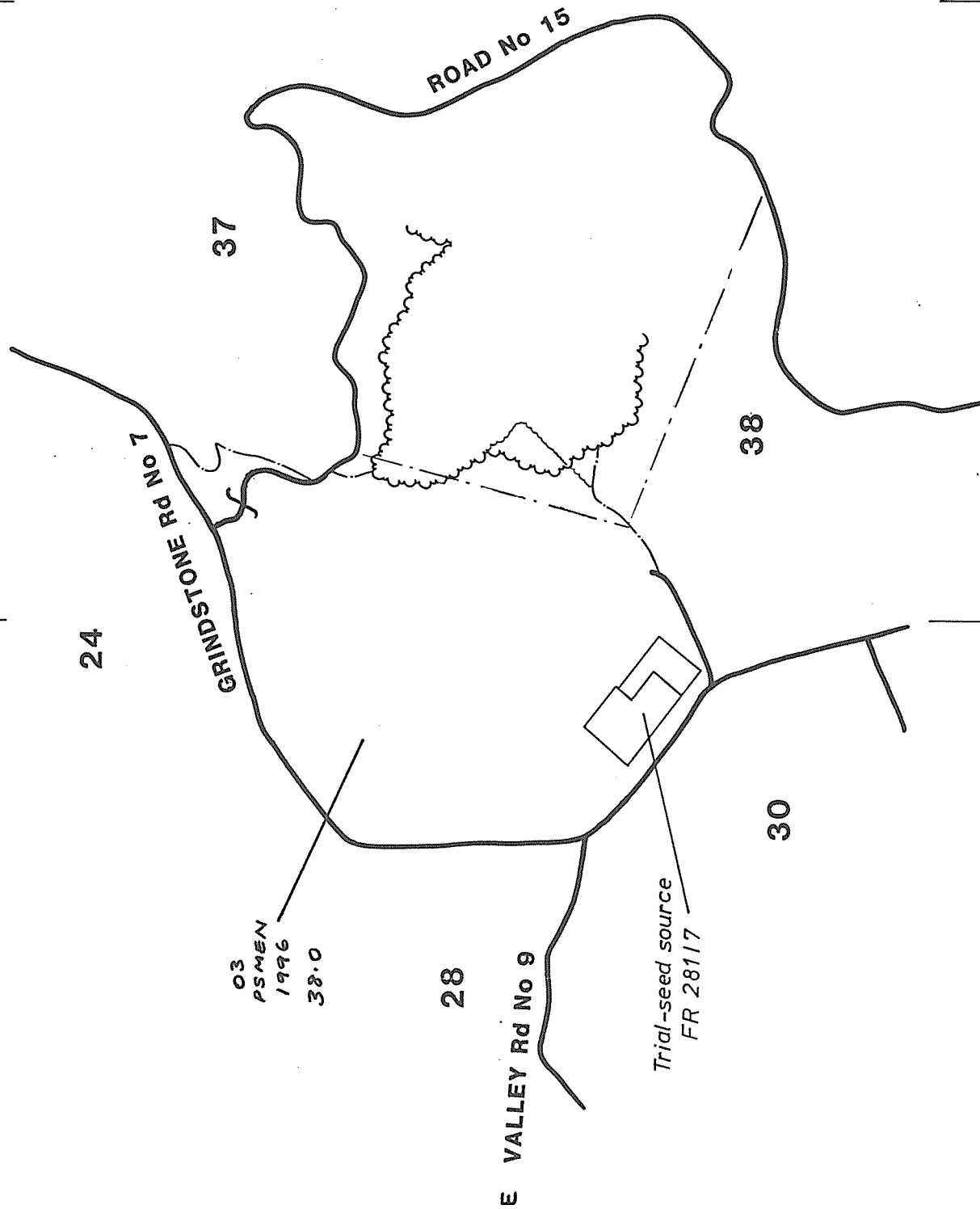
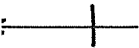
Trial map

FR281/7 Beaumont Forest cpt 27

28	24	904	28	17	13	810 811 903 223 808 812 808 825 423 124 813 809 422 907	9	5	811 906 423 901 816 814 905 815 813 825 818 808 223 322	1
29	25	900	29	21	900	322 819 817 902 906 222 901 123 905 815 816 900 904 814	10	6	902 812 900 123 903 817 907 819 904 222 810 124 809 422	2
30	26	906	30	22	904	817 907 124 816 815 903 813 811 808 222 902 905 810 123	11	7	816 809 900 905 901 812 818 813 907 819 905 808 904 814	3
31	27	906	31	23	904	900 906 904 903 817 819 825 124 907 905 818 815 813 223	12	8	814 812 810 817 819 815 123 825 818 904 816 813 907 423	4



(not to scale)



11/11/12

Breeding strategy

* Morning → 1971 → 268 → companion → results from trials
→ 1 → 850 → poly + dialled
→ 1994 → 180's
Afternoon → trials visit.

880's → sustainable

→ { 268's } → 1/2 trial gone
→ { 1971 trial }

Friday

*

Fred's clones

* Fletcher's clones (95, 96 plugging)

268's trial

704

Strategies for future

1 268 → re-surrect a few reps left
• diameter ; branching ; cores → juvenile - mature

850 → diam and density taken (3 cores per tree) / check for map of dialled -

880's → next September thinning to 1 ind per family
bark windows for age P.

The Impact of Harvesting Radiata Pine on site Productivity in Golden Downs Forest

Introduction

The sustained high productivity of New Zealand's managed forests will depend upon maintenance of soil fertility. Just as site productivity can be increased by operations such as fertilisation, so it can be decreased by operations such as harvesting that remove nutrients and change the physical structure of the soil. To address this a series of trials has been established throughout NZ on various soil types. The trial in Golden Downs Forest is second rotation, and as with the Kinleith trial, it includes a genetic component.

Site characteristics

Location: Between Kings and Blue Glen Roads in Golden Downs Forest on the way to Motueka Gorge; about 21 km south of Belgrove
Elevation: 450 m above sea level.
Soil type: Spooner Hill Soil

Objectives

1. To determine the effect of harvesting and site preparation on a major soil type in Golden Downs Forest on short- and long-term site productivity.
2. To determine if harvesting intensity is negatively correlated with succeeding forest growth.
3. To determine if the reasons for a negative correlation are nutritional.
4. To determine the relative performance of improved radiata pine families as affected by intensive harvesting and site preparation.
5. To provide information for management recommendations that will sustain productivity in the forest estate.

Trial establishment

The first rotation of *P. nigra* was clear felled in 1994 at age 45, with the retention and removal of different amounts of organic matter. To reduce the confounding effects of compaction, harvesting machinery was prohibited on the plots, and organic matter was removed manually. The trial was planted in July 1994 with a selection of 47 open-pollinated "880" series families plus three controls of *P. radiata* plants of 1/0 at 2500 stems/ha-1. Two seedlings of each family were planted in each split-plot at 2m * 2m spacing. Main treatments (replicated 4 times) examine the effects of harvesting intensity or organic matter removal (plots are 80m * 40m).

Main treatments:

FF	Whole tree removal and forest floor removal
WT	Whole tree removal
SO	Stem only removal

Split-plots examine the effect of fertiliser additions (plots are 40m * 40m; with 20m * 20m inner measurement plots). The following fertiliser was applied as an initial application in October 1994 to the +f split-plots: 50 kgN/ha as urea; 50 kgP/ha as NCRock; 50 kgK/ha as KCl; 8 kgB/ha as ulexite; and 100 kgMg/ha as calmag. From January 1995 urea has been applied quarterly at the rate of 50 kgN/ha to the +f split-plots. Tasman

Forestry Limited, Fletcher Challenge Forests, and Weyerhaeuser Company have provided total weed control. Table 1 summarises work to date.

Table 1. Golden Downs (FR220) summary of events

Event	Dates
First rotation established	1949 <i>P. nigra</i>
Initial assessment	10-12/93 measurements, biomass, litter, soil by depth to 60 cm, BD. 10/94 post-harvest debris sampled
Establish plots	9/93 (pre-harvest, forest floor removal by hand), 5/94 (debris removed by hand)
Harvest	2/94
Plant	7/94
Soil densimeter	1993 pre-harvest
Weed control	7/95 aerial Velpar 1/97 aerial Velpar @ 4 kg a.i./ha autumn/97 hand-cutting & spraying of woody weeds
Measurements: height, RCD	10/94, 8/95, 6/96, 9/97
Measurements: height, DBH	9/97, 5/98
Foliage sample (primary)	individual trees: 3/96
Foliage sample (secondary)	plots: 2/97, 3/98 individual trees: 2/97, 3/98
Foliage contents	3/98
Fertilise urea 50 kg N/ha	10/94, 1/95, 5/95, 8/95, 11/95, 3/96, 6/96, 9/96, 12/96, 2/97, 9/97, 12/97 3/98
Fertilise NCRock 50 kg P/ha	10/94
Fertilise KCl 50 kg K/ha	10/94
Fertilise ulexite 8 kg B/ha	10/94
Fertilise calmag 100 kg Mg/ha	10/94