The Development and Fire Behaviour Characteristics of the Gidgegannup Fire

by

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CONTENTS

THE GIDGEGANNUP FIRE

(1) INTRODUCTION.

The Gidgegannup fire commenced in the early afternoon of Wednesday, 1st March, on or about property owned by A. Goldman and caused extensive damage in the Gidgegannup, Herne Hill and Baskerville districts during the 1st, 2nd and 3rd days of March, 1961.

The fire was the subject of a Coronial Inquiry into the cause and origin. Evidence collected by the Police Department and presented in the Coroner's Court has been used extensively in reporting on the development and suppression action employed on this fire. The position of the fire perimeter has been drawn for various times during the course of the fire and can be seen on the plan attached to this report. From this plan the progressive movement of the fire can be followed and this allows a true appreciation of the strategy employed by the suppression forces.

The fire area lies North-east of Midland Junction and approached to within five miles of that town. The general location of the area is shown on a plan attached to this report.

(2) CAUSE.

A thunderstorm passed over the Gidgegannup area around 5 p.m. on Saturday, 25th February, 1961. A lightning strike on a dead ring-barked Jarrah tree caused a fire to start high up in the crown of the tree.

The owner of the property on which this lightning fire occurred had the tree felled on the following day after being advised to do so by his local Fire Control Officer. In direct contravention of various provisions of the Bush Fires Act, the property owner made no attempt to extinguish the fire and, in fact, used the existing fire as an excuse to heap up and burn other logs and tree tops in the vicinity of the fallen tree.

These heaped logs and tree tops continued to burn out and smoulder for several days. On Wednesday, 1st March, under very strong easterly winds and dangerous fire weather conditions, a spark or burning ember from these heaps ignited dry grass in their vicinity and in the absence of the property owners, the Gidgegannup fire commenced to burn rapidly in a west-south-westerly direction towards Herne Hill.

(3) FUEL TYPES.

The area through which the Gidgegannup fire burnt is mainly a low quality jarrah-marri forest. It has been heavily logged in the past and burnt at frequent intervals. As a consequence the forest is relatively open and would allow much greater wind movement than normally experienced in a high quality jarrah forest.

The entire area is held under private ownership and is in the process of development to cleared pasture land. These cleared areas are scattered throughout and allowed rapid movement of the head fire in the dry grasslands.

Tree cover on the Darling escarpment is very sparse and the fuel type consists mainly of a shrubby vegetation 4 - 6' high, with scattered jarrah and marri regrowth 15 - 20' high. The escarpment area is burnt fairly frequently and so the amount of fuel available for burning is not great.

The bush throughout the fire area could not be classed as dirty due to the frequency of bushfires in this district and the oldest fuel would not exceed 5 - 7 years. The average heights of the forest stand would be around 40 - 50'.

(4) DEVELOPMENT OF THE FIRE.

(a) Wednesday, 1st March.

The fire commenced major spread from just north of Goldman's house at about 12.35 p.m. Driven by a very strong E-N.E. wind averaging around 23 m.p.h. the headfire spread rapidly in a west-south-westerly direction. The headfire crossed Reserve Road at about 2.45 p.m. and Reen Road at about 3.20 p.m. Between Reen Road and O'Brien's Road, Gidgegannup Creek runs in an almost north-south direction. The headfire was thus cutting almost directly across the topography. This factor does not seem to have affected the rate of forward progress of the fire to any great extent as the headfire reached O'Brien's Road at about 4.30 p.m. Between 3 p.m. and 4 p.m. the headfire was travelling at about 165 chains per hour, which is an extremely fast rate of spread through low eucalypt forest on relatively level ground.

As the fire was approaching O'Brien's Road, local fire control officers and bush fire brigade members made an attempt to backburn from the eastern side of the road in an endeavour to halt the headfire. Shortly after these backburning operations commenced, the fire jumped to the western side of O'Brien's Road a short distance to the south of the backburn, and continued burning in a west south-westerly direction towards Cousins' property. This new headfire either resulted from a breakaway of the backburn or was caused by a spot or spot fires thrown from the main headfire, which at this stage would be some 70 chains east of the road.

The headfire entered the north-eastern corner of Cousin's property around 4.15 p.m. and by 5 p.m. was nearing his western boundary.

From 5 p.m. onwards the wind velocity started to decline and the rate of spread was drastically reduced due both to the decreasing wind velocity, increased fuel moisture content and the fact that the headfire had now reached the edge of the Darling escarpment and was burning downhill in a generally lighter vegetation type.

By 8 p.m. the headfire entered the eastern edge of Shannell's property and by 10 p.m. had reached the western side of the property. From 6 p.m. to 8 p.m. the rate of spread of the headfire had declined to approximately 25 chains per hour. Some time previously the headfire had been inspected by bushfire brigade officers from the Herne Hill-Baskerville area and these brigades commenced a backburn from Haddrill Road north-east to Bell Bros.' property at around 10 p.m. By this time the headfire had started to widen out coming down the escarpment and was about 30-40 chains from improved pasture country and vineyards on the coastal plain. Apparently the headfire and backfire joined around 11 p.m. and local brigades then fought the fire progressively southwards during the night as it came down the escarpment on to improved country.

The wind velocity had increased again around 11 p.m. and continued to blow between 20-24 m.p.h. from midnight until 6 a.m. the next morning.

(b) Thursday, 2nd March.

By 6 a.m. the fire had spread slowly southwards and had crossed Susannah Brook. With increasing temperatures and decreasing humidity this side spread increased under a moderately strong but somewhat decreasing wind velocity. By 11 a.m. the fire entered property owned by Burgess and Morris and reached Camperic Road by 12 noon. Except for one minor breakaway, local brigades held the fire along Camperic Road and protected improved pasture lands for some distance up Susannah Brook.

At around 2 p.m. the overall fire position was as follows :-

(i) The head of the fire on the western face was held generally along the edge of the foothills on a line running north from around James Road to the Swan River.

(ii) The perimeter west of O'Brien Road was burning slowly as a side fire towards Toodyay Road and was still largely uncontrolled. It was still between 40-60 chains north of Toodyay Road and was a very dangerous face if the wind direction changed to a more northerly component.

(iii) The section between O'Brien Road and Gidgegannup had been controlled by local brigades and was considered to be safe.

(iv) The section east of Gidgegannup was still burning slowly as a side fire and also considered a dangerous threat to breaking across Toodyay Road.

(v) The northern section from the point of origin to Reen Road had been controlled by local brigades.

(vi) The section from Reen Road across to O'Brien Road and westward to the Swan River was still burning slowly in patches but was considered relatively safe as it was progressing in very light two-year-old fuel against the wind.

Weather conditions were still very severe at this stage with a temperature at 101 degrees F., relative humidity 17% and the wind velocity at 17 m.p.h. from the east north-east.

Brigades were directed on to the sector east of Gidgegannup and this edge was brought under temporary control in the forested country.

Extensive planning was begun for a backburn to be undertaken from the foothills on Camperic Road along Toodyay Road to O'Brien Road. Heavy concentrations of manpower and equipment were assembled for the operation, which commenced around 5.30 p.m. The burn proceeded very slowly, due to the severe weather conditions and the fact that there were many improved holdings and unoccupied buildings which had to be carefully burnt around. At 6 p.m., shortly after the backburn commenced, the temperature was still 99 degrees F., relative humidity 19% and the wind east north-east at 14 m.p.h.

(c) Friday, 3rd March.

The fire continued a very slow side-spread during the early hours of the morning. The wind increased in velocity during the night and was blowing at 20 m.p.h. between 3 - 4 p.m. From midnight onwards, the wind direction commenced to back slowly and by 4 a.m. was blowing from the north-east. This increased the difficulties being experienced on the backburn along Toodyay Road, as the wind was carrying burning embers across the road into unburnt ground on the southern side and numerous hopovers were being experienced. These were quickly suppressed.

By 5 a.m. the backburn had reached a point some ½ - ¾ mile west of O'Brien Road. At 6 a.m. a further backburn was run from this point north to Burgess Road. Difficulties were experienced on this burn due to the need for careful burning around pasture and farm buildings and the need to protect the main P.M.G. telephone line. The Clackline Bush Fire Brigade did an excellent job of controlling this burn. The burn was completed by around 9 a.m. and the south-western sector became reasonably safe.

From 9 a.m. onwards, the wind started to back more northerly and by 11 a.m. was blowing from the north-north-east between 19-20 m.p.h. A dangerous breakaway occurred on the sector east of Gidgegannup around 9 a.m. and a strongly burning head commenced fairly rapid progress towards Toodyay Road. The breakaway occurred in timbered country where a weakly-held backburn had been put in the previous day. Some 30-40 men were diverted to this sector and the fire was held on Toodyay Road and was made reasonably safe by midday.

By midday on Friday 3rd, the entire perimeter was held and no running fire existed. At around 4.15 p.m. the wind changed suddenly from a north north-east to a westerly and then south-westerly direction. At the time of this change, the northern perimeter broke away between Reserve Road and Reen Road and commenced burning in a north-easterly direction. Local brigades then commenced a backburn along Reserve Road down to Woorolee Brook and back up Reen Road, a distance of some 5 miles. The operation was completed by 2 a.m. Saturday, 4th March, and the breakaway was contained between the two roads. From this point onwards no further breakaways occurred.

(d) Saturday, 4th March.

By 2.30 a.m., after the Reserve Road backburn was completed, all outside brigade personnel left the area and mopping up and patrol work was left to local brigade members. A complete inspection of the fire area was made by Bush Fires Board Wardens between 5 - 8 a.m. and future patrol operations planned with the local brigades. Control of the fire was then handed back to the Swan-Guildford Shire.

(5) CONTROL OF FIRE FIGHTING OPERATIONS.

The initial control of the Gidgegannup fire was handled by local brigades and fire control officers of the Swan-Guildford Shire. This phase embraced the period from the commencement of the fire at 12.40 p.m. on Wednesday, 1st March, until after 12 noon on Thursday, 2nd March. During this period the fire made its major run with the wind and did most property damage.

From around 3.30 a.m. on Thursday, 2nd March, the State Emergency Organisation became concerned at the serious situation and the Police Commissioner arranged to set up an emergency fire headquarters at Midland Junction. During Thursday morning, the Minister for Lands and Forests instructed the Under Secretary of Lands to assume responsibility for the control of the fire.

During that afternoon, the Forests Department made a senior officer available to assist with operational duties at Midland Junction and the Bush Fires Board made two wardens available. The State Emergency Service organised outside assistance from the armed services and petrol companies in the form of petrol tanks used for water-carrying purposes. Assistance from outside bush fire brigades was organised by the Bush Fires Board.

This outside equipment and men were undoubtedly welcomed by the local brigades who had borne the brunt of the initial suppression action and they were used to advantage on backburning operations and patrol.

Nothing, however, should detract from the fact that the major suppression job on this fire was handled by brigades of the Swan-Guildford Shire and, under the weather conditions prevailing, kept the burnt area to within reasonable limits. But for the fact that the wind direction held remarkably steady from an east north-east direction throughout most of the fire, the suppression job may have been much harder and the fire may have done heavy damage to populated areas south of the Toodyay Road.

(6) METEOROLOGICAL CONDITIONS.

The weather during the course of this fire was governed largely by an intensive tropical cyclone moving southward from the Kimberly area. It passed inland near Roebourne on March 1st and again crossed the coast, seaward, south of Carnarvon on March 3rd. The associated west coast trough caused extreme heat in the South-Western districts with strong and sustained easterly winds which backed slowly to the north-east and north as the trough deepened off the coast. The flow of continental air was extremely dry and even nocturnal humidities were very low. This period produced more extreme burning conditions than did the January or February fire periods, but was fortunately of shorter duration.

The meteorological conditions which prevailed during the Gidgegannup fire are given in the following tables. Data is taken from the Perth Weather Bureau and should be indicative of the conditions experienced in the fire area, which lies some 20 miles to the north-east.

Table 1. Meteorological Conditions recorded at Perth Weather Bureau on Wednesday, 1st March, 1961.

Time	Temp. °F.	Relative Humidity %	Wind Direction	Wind Velocity m.p.h.
0300	78	53	ESE	14
0600	75	56	E	15
0900	83	36	ENE	22
1200	98	12	ENE	22 (Max. gust 52 m.p.h. at 1335 hrs.)
1500	102	13	ENE	20
1800	98	12	ENE	17
2100	92	17	ENE	13
2400	89	17	ENE	23

Table 2. Meteorological Conditions recorded at Perth Weather Bureau on Thursday, 2nd March, 1961.

Time	Temp. °F	Relative Humidity %	Wind Direction	Wind Velocity m.p.h.
0300	83	25	ENE	24 (Max. gust 48 m.p.h. at 0459 hrs.)
0600	79	33	ENE	22
0900	83	31	ENE	20
1200	93	22	ENE	18
1500	100	17	ENE	16
1800	99	19	ENE	14
2100	92	23	ENE	12
2400	90	19	ENE	17

Table 3. Meteorological Conditions recorded at Perth Weather Bureau on Friday, 3rd March, 1961.

Time	Temp. °F	Relative Humidity %	Wind Direction	Wind Velocity m.p.h.
0300	88	19	ENE	20
0600	87	21	NE	17
0900	92	22	NE	19 (Max. gust 46 m.p.h. at 1030 hrs.)
1200	100	27	NNE	17
1500	105	21	NNE	16
1800	91	41	WSW	14
2100	84	57	S	7
2400	82	59	Calm	Calm

Several factors inherent in the above data are of considerable significance in affecting the fire behaviour on this fire :-

(1) The temperature and relative humidity at the time of commencement of the fire were 100°F. and 12% respectively. Thus, the fuel moisture content was at a critically low value and, combined with a strong wind with gusts reaching 52 m.p.h., the chance of a fire starting was very high and once started, the rate of spread, would be extreme.

(2) Overnight temperature and humidity conditions on the 1st-2nd March were very severe and gave the suppression forces little or no chance of effective fire suppression. Combined with the high temperatures and low relative humidity, winds remained very strong. Overnight temperature and humidity conditions on the 2nd-3rd March were even more severe, although the wind velocity was a little lower.

(3) One of the major factors which aided suppression action on this fire was the remarkably constant wind direction. The wind blew constantly from an east north-east direction from 8 am. on March 1st until 2 a.m. on March 3rd - a period of 42 hours. This allowed little side movement of the fire and materially aided control of the flanks. If the wind had backed quickly to the north-east or north, it is almost certain that the southern flank of the fire would have crossed Toodyay Road on a broad face and burnt into more densely populated areas around Parkerville, Stoneville and other towns along the Great Eastern Highway.

By the time the wind started to back northerly around 10 a.m. on Friday, 3rd March, most of the southern flank was under control along firmly established backburning lines.

(4) Due to the extreme fire danger which existed at the time of outbreak of the fire, the rate of forward progress was very rapid and it is doubtful if any fire suppression action would be successful in stopping the headfire under such conditions. Certainly any backburning operation against the headfire would have little or no chance of success and could be very dangerous. However, under a constant strong wind suppression action on the flanks presents little difficulty.

(5) Another noteworthy feature of the weather conditions during this period was the tendency for wind velocity to increase during the night. This effect is probably caused by night-time radiational cooling on the plateau country east of the Darling escarpment which sets up a downslope flow towards the coast. Generally fire fighting strategy depends very largely on the fact that winds will moderate during the night and allow easier suppression action. Along the Darling escarpment this is not generally the case and nocturnal winds are frequently as strong, if not stronger, than daytime winds. This was a feature of wind patterns during the Dwellingup fires in January and was one of the major contributing causes in the suppression difficulty experienced on those fires.

(7) FIRE BEHAVIOUR.

Fire behaviour on the Gidgegannup fire was quite typical of a fire burning in low quality dry sclerophyll Eucalypt forest under the meteorological conditions experienced.

(a) Rate of Forward Progress of the Fire.

The rate of forward progress during the initial stages of the fire is given in Table 4. Data is not extended beyond 10 p.m. on the first day as the headfire was controlled along the Swan vineyard belt and most subsequent spread from this time onwards was side movement of the southern flank.

Table 4. Rate of Forward Progress of the Gidgegannup headfire - 1st March, 1961.

Time	Distance from point of origin (miles)	Forward Progress in chains per hour.	
1240	Start		
1300	.25	60	
1400	.98	58	
1500	2.75	142	
1600	4.85	166	
1700	7.25	194	(1)
1800	8.07	66	
1900	8.45	32	(2)
2000	8.72	24	
2100	8.95	21	
2200	9.20	22	

Notes (1) This includes a probable breakaway from a backburn along O'Brien Road. The actual spread of the main headfire was approximately 92 c.p.h.

(2) From 1800 hrs. onwards the headfire commenced to burn down the Darling escarpment and was also in a generally lighter fuel type.

(b) Area increase of the Gidgegannup Fire.

The area burnt by the fire at various time intervals is given in Table 5. During the initial free burning period of the fire, area increased as the square of the time.

Table 5. Area burnt at various time intervals during the course of the Gidgegannup Fire.

Date	Time	Area (acs)	Increase per hour (acs)
1/3/61	1240	0	0
	1300	14	42
	1400	80	66
	1500	400	320
	1600	770	370

Date	Time	Area (acs)	Increase per hour (acs)	
1/3/61 contin.	1700	1632	862	
	1800	2450	818	
	2100	4160	570	
	2400	6650	830	(1)
2/3/61	0600	9900	542	
4/3/61	0300	18250	-	

Note (1) Backburning operations along the foothills had materially increased the area after 2200 hrs.

(c) General Notes on fire behaviour.

(a) The strong constant east south-east wind drove the headfire straight across the topography and the direction of travel was related directly to the wind direction. The headfire was extremely narrow and side spread was very slow at around 8 - 10 chains per hour, compared to the forward spread of around 160 chains per hour.

(b) The headfire region only started to widen out when the fire commenced a downhill run along the Darling escarpment. Also, by this time wind velocity had dropped considerably and this would allow greater side spread. By 2200 hours two separate heads had developed and the face was around 1 mile wide.

(c) There seems little doubt that the fire was spotting heavily between 1500-1600 hours, possibly up to 80 chains ahead. However, there is no evidence to suggest that it was spotting ahead to any great distance on its run down the escarpment.

(d) An examination of the headfire region between 1400-1600 hours on Wednesday 1st March, shows that the fire was not fully crowning i.e. the leaves were not being entirely consumed by the fire. This fact may indicate that under very strong wind velocities the flames are thrown forward at such an acute angle that the tree crowns are not consumed, even though the rate of spread is extremely high for a forest fuel type.

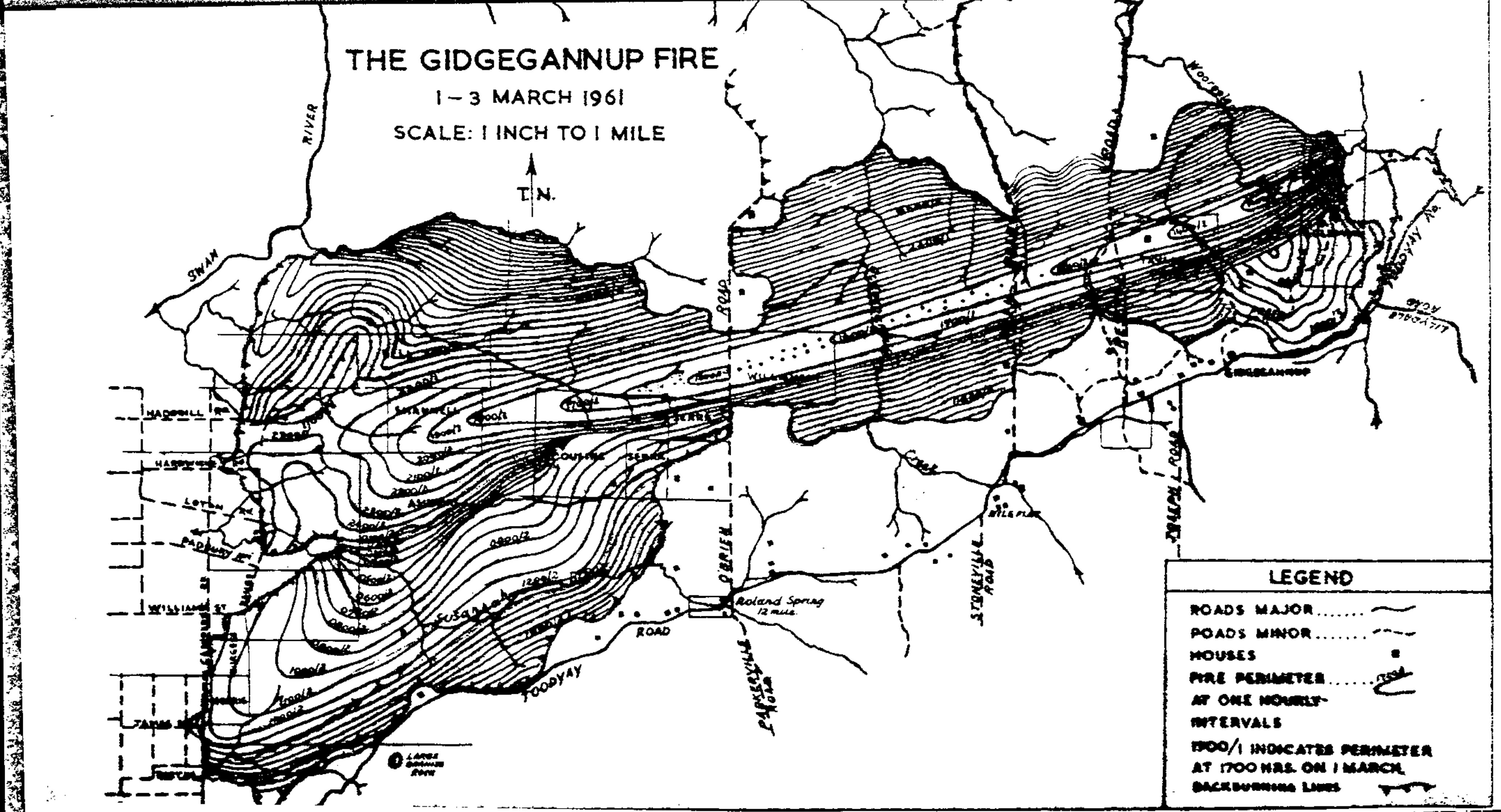
(8) FIRE DAMAGE.

The area through which the Gidgegannup fire burnt is mainly poor quality timbered land in the process of conversion to agricultural holdings. Consequently the area of cleared country is not very great and damage to pasture, stock and improvements caused by the fire was relatively light.

The following is an estimate made of the damage. Figures of improvement losses are those estimated by the property owner and quoted in the Coronial Inquiry. The total area covered by the fire was 18,250 acres.

		£
(1)	Houses, furniture, personal effects (1 house)	2,000
(2)	Sheds, yards and farm equipment	1,900
(3)	Fencing	1,050
(4)	Loss of improved pasture - 1500 acres @ £2. per acre	3,000
(5)	Loss of unimproved pasture - 4000 acres @ £1. per acre	4,000
(6)	Loss of stock - nil	-
(7)	Miscellaneous	1,000
(8)	Damage to 13,000 acres low quality timbered land @ 1/- per acre	650
	TOTAL	£13,600.

It is estimated that approximately 8,000 man hours were expended by volunteer firefighters in suppressing the fire. To this figure must be added wear and tear on vehicles and equipment. A conservative estimate of the fire suppression cost would be £6,000.


THE GIDGEGANNUP FIRE
1 – 3 MARCH 1961
SCALE: 1 INCH TO 1 MILE
T.N.
SWAN
RIVER
ROAD
O'BRIEN
Roland Spring
12 mile
ROAD
TOODYAY
GIDGEGANNUP
STONEVILLE ROAD
LEGEND
ROADS MAJOR
ROADS MINOR
HOUSES
FIRE PERIMETER AT ONE HOURLY INTERVALS
1900/1 INDICATES PERIMETER AT 1700 HRS. ON 1 MARCH
BACKBURNING LINES