



Contract for the
Hire of Aircraft for Aerial
Application of Pesticides and other
Services

[] Pty Ltd

July 2021

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CONTRACT FOR SERVICES

THIS AGREEMENT is made on the date specified in **Item 1 of Schedule 1** to this Agreement

BETWEEN The **FORESTRY CORPORATION OF NEW SOUTH WALES (FCNSW)**, a statutory State owned corporation constituted under the Forestry Act 2012 (NSW);

AND The **COMPANY** whose details appear in **Item 2(a) of Schedule 1** ('the **Company**')

1. DEFINITIONS AND INTERPRETATIONS:

1.1 Definitions:

In this Agreement unless a contrary intention appears:

'Agreement' means this Agreement;

'Aerial Application of Pesticides' means the preparation and controlled release of pesticides from an Aircraft;

'Aerial Application of Pesticides Services' means all of the Aerial Application of Pesticides work to be undertaken as part of this Agreement and ancillary Ferrying;

'Aircraft' means the aircraft to be provided by the Company under this Agreement for the provision of the Service.

'Appendix 6 Aerial Application of Sprays and Solids to Forest Crops' means the FCNSW publication having that title and attached as **Schedule 9**;

'Application Rate' means the volume of water and Pesticide to be applied to each hectare being treated;

'Area to be Treated' means an area in hectares which is to have an Aerial Application of Pesticide, and excludes No-Spray and Protective Buffer Areas.

'Area Treated' means the actual area in hectares that Pesticide has been applied to.

'Available' in relation to an aircraft means the aircraft is ready and available to perform the task required of it under this Agreement.

'Business Days' means the days Monday to Friday inclusive but excluding Public Holidays;

'Change in Control' means change in control of more than 50% of the shares of the Company with the right to vote in general meetings of the Company;

'Chemical Store' means a building in which Pesticide is safely stored prior to its use;

'Company' includes all employees, servants and agents of the Company;

'Commencement Date' means the date specified in **Item 3 of Schedule 1**;

'Designated Water Source' means a dam, stream, river or other water storage area approved by FCNSW to supply water for use in Aerial Application of Pesticides;

‘Management Area’ means an area of FCNSW estate defined by FCNSW as an operating Management Area.

‘Equipment’ means all equipment necessary for the safe mixing, loading and application of Pesticide and the safe operation of the Aircraft, including portable weather stations. Provision of equipment requiring specific mention is provided for under **Schedule 2** of this Agreement.

‘Expiration Date’ means the date specified in **Item 4 of Schedule 1**;

‘Ferrying’ means where FCNSW requests a helicopter to fly for more than 45 minutes out of and back to the management area where it is based;

‘Flight Crew’ means all of the Company’s personnel required to support the operational activities of this Agreement, including the Pilot;

‘Flight line’ means the path travelled by the Aircraft whilst applying Pesticide;

‘Force Majeure’ means:

An event (other than the payment of money) arising from an act of God, industrial dispute, order, act of Government, act or omission of any Authority, war, sabotage, riot, civil disobedience, epidemic, disease, fire, strike, lockout, flood, earthquake, order of a court obtained by a person other than a party to this Agreement or a related body corporate of a party to this Agreement; or accidental damage to, or destruction of, plant and equipment, explosion, breakdown of plant (except where such breakdown arises from the failure to maintain, repair or replace such plant), failure of power or fuel supplies (which is not confined to the party claiming Force Majeure), natural disaster (including prolonged, extreme adverse weather conditions), an unlawful act by other persons or any similar event which prevents a party from performing its obligations in whole or in part under this Agreement;

‘Insolvency Event’ means in respect of a party :

- (a) a receiver, manager, receiver and manager, trustee, administrator, controller or similar officer being appointed in respect of the party or any asset of the party;
- (b) a liquidator or provisional liquidator being appointed in respect of the party;
- (c) a moratorium of any debts of the party or an official assignment or a composition or an arrangement (formal or informal) with the party’s creditors or any similar proceeding or arrangement by which the assets of the party are subjected conditionally or unconditionally to the control of the party’s creditors being ordered, declared or agreed to;
- (d) the party becoming, or admitting in writing that it is, or being declared to be insolvent or unable to pay its debts;
- (e) any writ of execution, garnishee order or similar order, attachment, distress or other process in an amount exceeding \$10,000,000 (or its equivalent in a foreign currency) being made, levied or issued against or in relation to any asset of the party (which is not stayed, withdrawn or satisfied within 14 days of when it is made, levied or issued);
- (f) the party suspending payments of its debts generally; or
- (g) the party being, or under legislation being presumed or taken to be, insolvent (other than as the result of a failure to pay a debt or claim the subject of a good faith dispute);

‘Loading Site’ means a location designated by FCNSW at which Pesticide can be safely mixed and loaded into an Aircraft.

‘Meteorological Constraints’ means weather conditions that are restrict the safe and effective Aerial Application of Pesticides specified in **Part 2 of Schedule 6**.

‘Month’ means a calendar month;

‘Nominated Operating Bases’ means the locations identified in **Item 6 Schedule 1**;

‘No Spray Area’ means an area of land which may not be sprayed with Pesticide;

‘Pesticide’ means any chemical that may be applied under this agreement to control insects, fungi or vegetation;

‘Pilot’ means personnel holding an Australian Commercial Pilot’s License or higher with an Agricultural Grade 1 Rating nominated in **Schedule 3** or a satisfactory replacement as agreed by FCNSW;

‘Pilot Error Damage’ means damage caused to a Primary Aircraft, that occurs as a result of pilot error.

‘Primary Aircraft’ means the aircraft identified in **Schedule 2** as Primary Aircraft;

‘Protective Buffer Area’ means an area of land which has been identified as providing an amelioration of overland Pesticide movement;

‘Quarter’ means each of the three (3) month periods January to March, April to June, July to September and October to December in each Year of this Agreement.

‘Rate’ means the prices for Services set out in **Schedule 4, Part 1**

‘Safety Management and Recommended Operating Procedures’ means the document attached as **Schedule 7**;

‘Scheduled Maintenance’ means routinely scheduled aircraft maintenance that is preventative maintenance and performed at regular intervals. This type of maintenance generally includes hour-based inspections, annual inspections, calendar inspections and progressive (or phase) inspections as well as pre-flight checks to ensure the aircraft is airworthy and ready to be flown.

‘Services’ means the Aerial Application of Pesticides Services.

‘Site Risk Assessment’ means the identification, evaluation, and estimation of the levels of risks involved providing the Services at a site, their comparison against benchmarks or standards, and determination of an acceptable level of risk;

‘Supervisor’ means an FCNSW staff member designated to manage and/or supervise aspects of the Services.

‘Temporary Operating Bases’ means the locations identified in **Item 7 Schedule 1**;

‘Term’ means the duration of this Agreement;

‘Unavailable Aircraft Days’ in relation to a Primary Aircraft means;

- a) A day when the Primary Aircraft is not operational due to Pilot Error Damage;
- b) A day when the Primary Aircraft is not Available despite FCNSW giving no less than 48 hours notice of the requirement for the Primary Aircraft to be Available;

‘Unscheduled Maintenance’ means maintenance that is not Scheduled Maintenance or maintenance necessary to repair Pilot Error Damage, being maintenance occurring when an Aircraft component has malfunctioned or is suspected of malfunctioning, the necessity for which is unforeseen.

‘Year’ means a calendar year.

1.2 Interpretation

In this Agreement, unless the context requires otherwise:

- 1.2.1 headings are for convenience only and do not affect the interpretation of the Agreement;
- 1.2.2 words importing the singular include the plural and vice versa;
- 1.2.3 words importing a gender include any gender
- 1.2.4 a reference to a natural person includes a Company, partnership, joint venture, association, corporation or other body corporate and any governmental agency
- 1.2.5 a reference to anything includes a part of that thing
- 1.2.6 a reference to a clause, party, annexure, exhibit or schedule is a reference to a clause of and a party, annexure, exhibit and schedule to this Agreement;
- 1.2.7 a reference to a document includes all amendments or supplements or replacements or notations of that document
- 1.2.8 a reference to a party to a document includes that party's successors and permitted assigns;
- 1.2.9 no rule of construction applies to the disadvantage of a party because that party was responsible for the preparation of this Agreement or any part of it;
- 1.2.10 a reference to dollars or \$ is a reference to the lawful currency of the Commonwealth of Australia.
- 1.2.11 a schedule that forms part of this agreement can be varied with mutual consent by both parties without varying any further condition or schedule of the contract.
- 1.2.12 a reference to a statute, ordinance, code or other law includes regulations and other statutory instruments under it and consolidations, amendments, re-enactments or replacements of any of them (whether of the same or any other legislative authority having jurisdiction).

2. SCOPE OF AGREEMENT

2.1 Subject to the terms and conditions set out in this Agreement:

- 2.1.1 the Company must supply the Services as required by FCNSW during the Term; and
- 2.1.2 FCNSW must pay the Rates for the Services supplied by the Company.

3. COMMENCEMENT AND DURATION OF AGREEMENT

This Agreement will take effect from the Commencement Date and operate until the Expiration Date unless sooner terminated or later extended under the provisions of this Agreement.

4. SERVICES

4.1 The Company must comply with:

- 4.1.1 **Part 1 of Schedule 5** and **Schedule 6** in relation to the provision of Aerial Application of Pesticides Services, and
- 4.1.2 Safety requirements detailed in **Schedule 7**; and
- 4.1.3 **Schedule 9**; Appendix 6 Aerial Application of Sprays and Solids to Forest Crops but only to the extent is it not inconsistent with any other provision of this Agreement

4.2 FCNSW must comply with:

4.2.1 **Part 2 of Schedule 5** in relation to the provision of Aerial Application of Pesticides Services

4.2.2 If one of the Primary Aircraft is damaged sufficiently to make it Un-Available for an extended period FCNSW may terminate this Agreement as it relates to that Primary Aircraft unless the Company promptly replaces the aircraft with one of comparable functionality at no additional charge.

5. SAFETY

The Company must comply with the following safety requirements, which are supported by details in **Schedule 7**.

5.1 The Company must comply with all relevant Commonwealth and State legislation and regulations which relate to air navigation, any other matters associated with the use of Aircraft in the carrying out of the Services.

In particular, the Company must produce evidence of, and maintain at all times throughout this Agreement;

- a. Civil Aviation Authority of Australia Air Operator's Certificate,
- b. Aircraft Operators Pesticide Applicator License,
- c. Australian Commercial Pilots Licences,
- d. Pilots Pesticide Rating License, and
- e. Training and accreditation in accordance with the Pesticides Amendment (User Training) Regulation 2013 for employees required to load and handle pesticides.

5.2 Nothing in this Agreement shall require the Company to carry out or perform any action or to commence to carry out any action which in the opinion of the Company is likely to result in an action for breach of the rules of the air and in particular the Civil Aviation Act 1988 (CTH), the Civil Aviation Regulations and the Civil Aviation Orders together with any lawful direction, restriction or permission which might issue pursuant to and in accordance with a any such legislation or subordinate legislation.

5.3 In the event that the Company concludes that any action required to be carried out by it pursuant to this Agreement, or any action requested of it by FCNSW during the operation period, could reasonably result in breach of air law then it shall forthwith inform FCNSW in writing and offer such advice to FCNSW as may be appropriate to enable the proposed operation to be carried out in a modified or altered form which would not result in a breach of air law.

5.4 The Company must perform all operations in a safe and professional manner, including implementing the Safety Management and Recommended Operating Procedures, where a reference to the Contractor shall be a reference to the Company,

5.5 The Company must ensure that all persons engaged in the provision of the Services observe such directions as may be issued from time to time by FCNSW for the safety of workers.

5.6 The Company must perform their work in accordance with their Safety Management System and provide a Site Risk Assessment as detailed in **Schedule 7**. In particular **Schedule 7, Section 9** details the minimum Site Risk Assessment considerations to be used when considering the expected range of site conditions, Aircraft capability and Pilot experience and ability, prior to the provision of Services. This assessment should be used to define safe operating practice for the operation to be carried out.

5.7 The Company must ensure all plant, equipment, and tools used in providing the Services are safe to operate and are handled safely.

5.8 The Company must ensure that all plant, equipment, tools and materials transported to and from and within a site at which or from which Services are provided are done so in a safe manner according to Roads and Maritime Services (RMS) and CASA requirements. All loads must be properly secured in transit.

- 5.9 The Company must ensure that all persons engaged in the provision of Services use approved protective clothing and equipment with consideration of the issues/requirements contained within the Site Risk Assessment which should reference the safety requirements of the MSDS and the Pesticide label.
- 5.10 The Company must ensure that every vehicle in use by the Company or its employees travelling to, on and from locations from which the Services are to be provided contains an adequate first aid kit in consideration of the work to be conducted, numbers of workers and any relevant site specific considerations. There is to be at least one such first aid kit per vehicle. The Company must ensure the kit(s) contain all the required contents and that those contents are not beyond their use-by-date.
- 5.11 The Company must provide monthly to FCNSW, workplace incident statistics in accordance with Australian Standard AS 1885.1 –1990 Workplace Injury and Disease Recording Standard, or its equivalent including, a form is provided in **Schedule 8** which may be used to this end if required:
- a. sum of all hours worked by each effective full time equivalent person;
 - b. total number of effective full time equivalent persons; and
 - c. number of lost time injuries and total days lost.
 - d. Near Misses and Medical Treatment Incidents must also be recorded
- 5.12 During the Term FCNSW (including its employees, officers or agents) may audit and or monitor the Company's implementation and adherence to any specific safety requirements of this Agreement in addition to the Company's obligations under the Work Health & Safety Act 2011 and the Work Health & Safety Regulation 2011. Auditing and monitoring undertaken by FCNSW is independent of a Company's internal auditing and monitoring responsibilities.
- 5.13 Subject to FCNSW acting reasonably, the Company must assist FCNSW in satisfaction of its auditing and monitoring requirements.

6. RATES OF HIRE (SUBJECT TO PROPOSAL)

- 6.1 The Rates payable by FCNSW for the Services at the Commencement Date are as specified in **Schedule 4, Part 1**
- 6.2 If provided for in **Part 2 of Schedule 4**, the Rates shall be varied from time to time in accordance with **Part 2 of Schedule 4**.
- 6.3 Payment of the Rates is subject at all times to Company's performance of the Services in a satisfactory and timely manner.

7. PAYMENT(TO BE UPDATED TO INCORPORATE ANY AGREED CONCEPTS FROM PROPOSAL)

- 7.1 The Company shall issue FCNSW with monthly invoices for the Services delivered. The Company may issue each invoice to FCNSW by e-mail at an e-mail address or facsimile number provided by FCNSW for that purpose.
- 7.1 If an aircraft becomes unavailable for any period of time during the spraying season as specified in Schedule 2, It is the companies responsibility to provide, or work with FCNSW to source, an alternative aircraft of similar capability at the companies expense.
- 7.2 FCNSW may withhold payment of the Retention Amount for each invoice if specified in Schedule 5, as security to guarantee the proper performance of Services. FCNSW must release to the Contractor any monies retained under this clause 7.2 as soon as FCNSW is able to confirm the proper performance of the Services.
- 7.3 GST invoices

In this Agreement:

- 7.3.1 'Adjustment Note' has the same meaning as in the GST Act;
- 7.3.2 'GST' has the same meaning as in the GST Act;
- 7.3.3 'GST Act' means the A New Tax System (Goods and Services Tax) Act 1999 (C'wealth);
- 7.3.4 'GST Price Adjustment' means the adjustment to the amount payable to the Company provided for in clause 3;
- 7.3.5 'Tax Invoice' has the same meaning as in the GST Act;
- 7.3.6 'Taxable Supply' has the same meaning as in the GST Act;
- 7.3.7 Terms defined in the GST Act have the same meaning in this clause unless provided otherwise.
- 7.3.8 References to any statute or statutory provision include that statute or statutory provision as amended, extended, consolidated or replaced by subsequent legislation and any orders, regulations, instruments or other subordinate legislation made under the relevant statute.
- 7.4 The amounts due to the Company under this Agreement shall include an amount equal to the GST liability incurred by the Company under the GST Act in connection with taxable supplies made pursuant to this Agreement.

8. INDEMNITY AND INSURANCE

- 8.1 The Company indemnifies FCNSW against all actions, proceedings, claims, demands and expenses by any person in respect of or arising out of the negligent performance by the Company of its obligations under this Agreement.
- 8.2 FCNSW indemnifies the Company against all actions, proceedings, claims, demands and expenses by any person in respect of or arising out of the negligent performance by FCNSW of its obligations under this Agreement.
- 8.3 The Company will take out and maintain with a reputable insurance company;
 - 8.3.1 Aviation Hull and Liability Insurance – including passenger liability insurance. The insurance policy must note the interest of FCNSW in relation to the provision of Services.
 - 8.3.2 Airport Owners & Operators Liability Insurance (can be called Hangar Keepers Insurance): to cover the contractor for damage to people, infrastructure and other aircraft through activities not tied to an aircraft registration number. FCNSW requires a \$20-million-dollar value on this policy.
 - 8.3.3 Chemical Drift Liability Insurance (can be called Aircraft Application Liability Insurance also).
 - 8.3.4 Workers Compensation Insurances to the extent required by the law of the State of New South Wales,
- 8.4 Any insurance policy referred to under **clause 8.3.1, 8.3.2 and 8.3.3** must contain a provision requiring the insurer, whenever the insurer gives to or serves on the Company a notice of cancellation or any other notice under or in relation to the policy of insurance, at the same time to inform FCNSW in writing that the notice has been given to or served on the Company and ensure that notice of any claim is given by the insurer to FCNSW and that FCNSW is kept fully informed of subsequent action and developments concerning such claim.

9. LIMITS ON SUPPLY

- 9.1 The Company acknowledges that nothing in this Agreement entitles the Company to future work or constitutes a guarantee of work other than as expressly provided in this Agreement.

- 9.2** The Company acknowledges that nothing in this Agreement limits FCNSW contracting Services from any other party.
- 9.3** No claim may be made by the Company against FCNSW for failing to provide the Contractor with the work comprising the Services in whole or in part. However, without FCNSW giving any warranty or undertaking to allocate Aerial Application of Pesticides Services or the timing of the allocation of that work **Schedule 1, Item 5** provides an estimated Area to be Treated under this Agreement and **Schedule 4, Part 3** provides further detail on this estimate.

10. FORCE MAJEURE

- 10.1** Notwithstanding any other provision of this Agreement if either party is prevented from performing all or any of its obligations under this Agreement by reason of Force Majeure ("the affected party"):
- 10.1.1 the other party will have no claim against the affected party under this Agreement, to the extent that the non-performance is due to the Force Majeure;
- 10.1.2 if the affected party is unable to resume the performance of its obligations within a period of one (1) month from the date of the occurrence of the Force Majeure or the date when the occurrence of the Force Majeure first became apparent either party may terminate this Agreement by written notice.
- 10.2** A party affected by Force Majeure must give initial notice of the existence or occurrence of the Force Majeure as soon as is practicable to do so and in any case it must provide a more detailed notice within fourteen (14) days of the Force Majeure being apparent which provides clear details of the event or occurrence claimed as Force Majeure and setting out particulars of the likely effects of the event or occurrence in question.

11. TERMINATION OF AGREEMENT

- 11.1** FCNSW may terminate this Agreement if the Company:
- 11.1.1 suffers an Insolvency Event; or
- 11.1.2 commits a specified material breach of this Agreement and the default is not remedied by the Company to the satisfaction of FCNSW (acting reasonably) within a period of seven (7) days after notice of the breach has been served on the Company.
- For the purposes of this **clause 11.1.2** a specified material breach is any of the following breaches:
- a) failing to comply with **clause 4.1**;
- b) purporting to assign the whole or any part of this Agreement without the consent of FCNSW in breach of **clause 14**.
- 11.1.3 commits a material breach of this Agreement other than a breach specified in **clause 11.1.2** and the default is not remedied by the Company to the satisfaction of FCNSW within a reasonable period after notice of the breach has been served on the Company.
- 11.2** If FCNSW commits a material breach of this Agreement and the default is not remedied within a reasonable period after notice to remedy the breach has been served on FCNSW, then the Company may terminate this Agreement.
- 11.3** The party terminating this Agreement arising from the default of the other party may claim damages for all loss arising from the default unless the claim for damages is excluded under this Agreement provided that in no circumstances shall a party be entitled to claim consequential loss arising from the default.

12. DISPUTES

The following procedures will apply to disputes under this Agreement:

- 12.1 The party claiming a dispute must first seek resolution by negotiation and, failing that, the dispute must be referred to mediation by the Australian Disputes Centre ('ADC').
- 12.2 In the event that the dispute has not been resolved within twenty eight (28) days after the appointment of a mediator then, unless otherwise agreed in writing between the parties, the dispute must be submitted to arbitration, administered by ADC.
- 12.3 The arbitrator will be agreed between the parties or, failing Agreement, shall be appointed by the ADC. The arbitrator must not be the same person as the mediator.
- 12.4 Any mediation or arbitration proceedings must be held in Sydney. Any arbitration must be undertaken in accordance with and subject to the Institute of Arbitrators Rules for the conduct of Arbitration.
- 12.5 The Arbitrator or some person appointed on the Arbitrator's behalf may investigate the Company's and FCNSW's affairs and accounts so far as may be necessary to assist the Arbitrator to determine any matter referred for arbitration. The Company and FCNSW must give the Arbitrator full access to all accounts and papers necessary for that purpose and must afford the Arbitrator full information and assistance.
- 12.6 Unless otherwise directed by the mediator or arbitrator, the parties must bear equally the costs of the mediator or arbitrator under **clause 12**.

13. VARIATION

- 13.1 This Agreement contains the total understanding of the parties.
- 13.2 None of the provisions of this Agreement may be varied, waived, discharged or released either at law or in equity, unless by the express consent of the parties in writing.

14. ASSIGNMENT

- 14.1 The Company may not without the prior written consent of FCNSW assign its rights and responsibilities under this Agreement to any person provided that FCNSW's consent will not be unreasonably withheld. Any Change in Control of the Company will be deemed to be an assignment of the Company's rights and entitlements under this Agreement.
- 14.2 The consent given by FCNSW may be subject to the assignee executing all Agreements and other documents which FCNSW reasonably requires.
- 14.3 All money due to FCNSW under this Agreement must be paid before any assignment of it by the Company.

15. NOTICE

- 15.1 Any notice required to be served under this Agreement may be served at the places specified for each party as set out in **Item 2, Schedule 1**. If notice is sent by email it shall be deemed to have been served on the next business day after such notice is given provided receipt of the email is verified by the sender's email account specifying the addressee's email.
- 15.2 The parties may change the address for service of notice from time to time by notice in writing to the other party.

16. GOVERNING LAW

- 16.1** This Agreement is governed by the laws of New South Wales and the parties agree to the jurisdiction of the Courts of New South Wales.

17. SEVERABILITY

- 17.1** If any provisions of this Agreement are held to be invalid, illegal, or unenforceable by a Court or other tribunal of competent jurisdiction, the validity, legality, and enforceability of the remaining provisions will not in any way be affected or impaired thereby.

18. CONFIDENTIALITY

- 18.1** No party will disclose the contents or terms of this Agreement or any information or documents received by it in connection with the negotiation of this Agreement or pursuant to the provisions of this Agreement without the prior written consent of the other parties, except to the extent that:

18.1.1 the information is available to the public generally;

18.1.2 that party is required to make the disclosure by law or to make any filing, recording or registration required by law;

18.1.3 the disclosure is necessary or advisable for the purpose of obtaining any consent, authorisation, approval or licence from any public body or authority;

18.1.4 it is necessary that the disclosure be made to any taxation or fiscal authority;

18.1.5 the disclosure is made on a confidential basis to the professional advisers of that party (including any industry association) for the purpose of obtaining advice in relation to this Agreement or the enforcement of this Agreement or otherwise for the purpose of consulting those professional advisers;

18.1.6 the disclosure is required or desirable to be made in pursuance of any procedure for discovery of documents and any proceedings before any court, tribunal or regulatory body; or

18.1.7 the disclosure is made on a confidential basis to a potential financier of the party, purchaser of the party or shares in the party, or assignee of the party's interest in this Agreement.

19. RELATED AGREEMENTS

Where a proponent is awarded multiple contracts any relevant considerations across agreements may require insertion of appropriate clauses

Executed as an Agreement

Signed for and on behalf of the Forestry)
Corporation of New South Wales)
by its delegate)
)
.....)

.....

in the presence of:

.....
Witness

Executed by the Company)
by [two directors] or [a director and)
its secretary] or [its sole director])
)
.....
secretary/director

)
.....
director

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SCHEDULE 1 PARTICULARS SCHEDULE

ITEM 1

| |
|---|
| Date of Agreement:day of....., 2020 |
|---|

ITEM 2 - Contact Details

(A) THE COMPANY

| | |
|-----------------------------|---------------|
| Company Name: | |
| Name(s) of Principal(s): | |
| Australian Company Number: | |
| Australian Business Number: | |
| Business Address: | |
| Contact Details: | Ph: Email: |

(b) Forestry Corporation of NSW

| | |
|-------------------|--|
| Title: | Authorised: CEO Contact: Lyndon Orpwood – Sales and Procurement Coordinator (Northern) |
| Business Address: | Cnr Panorama Avenue & Browning Street Bathurst, NSW 2795 Bathurst, NSW 2795 |
| Mobile Number: | 0418 753 292 |
| e-mail address: | Lyndon.Orpwood@fcnsw.com.au |

ITEM 3

| | |
|-------------------|-------------|
| Commencement Date | 1 July 2021 |
|-------------------|-------------|

ITEM 4

| | |
|-----------------|--------------|
| Expiration Date | 30 June 2024 |
|-----------------|--------------|

ITEM 5

| | |
|--------------------|----------------------------------|
| Area to be Treated | Approximately 29,000ha per year. |
|--------------------|----------------------------------|

ITEM 6

| | |
|-----------------------------|---|
| Nominated Operating Base(s) | Primary Aircraft 1 = Bathurst region Primary Aircraft 2 = Tumut region Primary Aircraft 3 = Grafton Region(to be agreed to between company and contractor) |
|-----------------------------|---|

ITEM 7

| | |
|-----------------------------|---|
| Temporary Operating Base(s) | Walcha Region Bombala Region |
|-----------------------------|---|

SCHEDULE 2 LOCATION AND SPECIFICATIONS OF AIRCRAFT & EQUIPMENT

The Company will provide the following aircraft and Equipment:

AIRCRAFT

Primary Aircraft are to be made available at the Nominated Operating Base to achieve the required operations specified in **Schedule 4 Part 3**.

| | |
|--|--------------------------------------|
| Primary Aircraft 1 | |
| Nominated Operating Base | Bathurst, NSW |
| Aircraft registration number | |
| Certificate of registration holder | |
| Benchmark fuel consumption (litres/hr) | |
| Boom and Nozzle Configuration | Boom Length: m (<75% of rotor width) |
| | Length of Aircraft Rotor: m |
| | Nozzle Type: CP & Accuflow |
| Portable Weather Station | |

| | |
|--|-------------------------------------|
| Primary Aircraft 2 | |
| Nominated Operating Base | Tumut, NSW |
| Aircraft registration number | |
| Certificate of registration holder | |
| Benchmark fuel consumption (litres/hr) | |
| Boom and Nozzle Configuration | Boom Length: m(<75% of rotor width) |
| | Length of Aircraft Rotor: m |
| | Nozzle Type: CP & Accuflow |
| Portable Weather Station | |

| | |
|--|-------------------------------------|
| Primary Aircraft 3 | |
| Nominated Operating Base | Grafton |
| Aircraft registration number | |
| Certificate of registration holder | |
| Benchmark fuel consumption (litres/hr) | |
| Boom and Nozzle Configuration | Boom Length: m(<75% of rotor width) |
| | Length of Aircraft Rotor: m |
| | Nozzle Type: CP & Accuflow |
| Portable Weather Station | |

Equipment

All Primary Aircraft are to be supported by an accompanying truck based support vehicle with attached bunded, chemical mixing ability with water holding capacity to enable the continuous operation of the aircraft.

The Company will provide all ancillary equipment necessary to perform Aerial Pesticide Services including the supply and transportation of appropriate signage.

A water source within a 30km radius of the operational site will be provided by FCNSW. The water source will occasionally be from dams so pumping equipment to access the dam water will be required to be supplied by the company. In the event that water is not able to be provided within a reasonable distance, then FCNSW will supply a bulk water tanker for the spraying operation.

Staff

Appropriately trained staff to support and operate the helicopters and equipment need to be supplied including an employee with a forklift licence.

SCHEDULE 3 PILOT DETAILS

The Company will utilise the following Pilots to fly the Primary Aircraft from **Schedule 2**;

CHIEF PILOT

Location:

| | |
|-----------------------------------|--|
| Name | |
| ARN | |
| Licence type | |
| No. of instrument rating renewals | |
| No. of flying hours - PIC | |
| Total turbine hours | |
| Hours on type flown | |

SENIOR PILOT

Location:

| | |
|-----------------------------------|--|
| Name | |
| ARN | |
| Licence type | |
| No. of instrument rating renewals | |
| No. of flying hours - PIC | |
| Total turbine hours | |
| Hours on type flown | |

LINE PILOT

Location:

| | |
|-----------------------------------|--|
| Name | |
| ARN | |
| Licence type | |
| No. of instrument rating renewals | |
| No. of flying hours - PIC | |
| Total turbine hours | |
| Hours on type flown | |

LINE PILOT

Location:

| | |
|-----------------------------------|--|
| Name | |
| ARN | |
| Licence type | |
| No. of instrument rating renewals | |
| No. of flying hours - PIC | |
| Total turbine hours | |
| Hours on type flown | |

SCHEDULE 4 RATE SCHEDULE

Part 1.

Part 2: adjustment of Rates

the Annual Rate will be adjusted at the beginning of each year of the contract by the movement in the Consumer Price Index (Australian Bureau of Statistics 6401.0 quarterly release for eight capital cities, All Groups CPI) over the preceding 12 months;

the Operating Rate (OR) will be adjusted on a quarterly basis if the Reference Fuel Price (RF) varies by more than 5% against the Benchmark Fuel Price (BF) using the formulae below, where FC = hourly fuel consumption for that aircraft;

where the $RF > BF$ the $OR = (((RF - BF) - (0.05 \times BF)) \times FC)$, and

where the $BF > RF$ the $OR = (((BF - RF) - (0.05 \times BF)) \times FC)$.

The Benchmark Fuel Price to be used is the pump price of aviation fuel in Parkes, which at 1 November 2020 = \$ per litre.

The Reference Fuel Price is the pump price of aviation fuel in Parkes on the last day of the preceding quarter over which any rate adjustment is to be applied.

Part 3 –Estimated Area to Be Treated Annually

| Work parcel | Financial Year | Region | Program | Hectares | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Total |
|-------------|----------------|------------------|-----------------------------------|----------|-----|-----|------|------|------|-----|-----|-----|------|------|------|-----|-------|
| S1 | F22-FF26 | Tumut | Spring Pre-Plant 100 L/ha | Hectares | | | | 375 | 1125 | | | | | | | | 1500 |
| S1 | F22-FF26 | Tumut | Autumn Pre-plant100 L/ha | Hectares | | | | | | | | | 2000 | 2000 | 2000 | | 6000 |
| S1 | F22-FF26 | Tumut | Post Plant 60 L/ha | Hectares | | | 1680 | 1680 | 840 | | | | | | | | 4200 |
| S1 | F22-FF26 | Tumut | Wattle Post Plant 60 L/ha | Hectares | | | | | 160 | 240 | | | | | | | 400 |
| S1 | F22-FF26 | Bombala | Spring Pre-Plant 100 L/ha | Hectares | | | | | 250 | 250 | | | | | | | 500 |
| S1 | F22-FF26 | Bombala | Pre Plant 100L/ha | Hectares | | | | | | | | | 666 | 1334 | | | 2000 |
| S1 | F22-FF26 | Bombala | Post Plant 60 L/ha | Hectares | | | 500 | 1000 | 500 | | | | | | | | 2000 |
| Work parcel | Financial Year | Region | Program | Hectares | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Total |
| B1 | F22-FF26 | Bathurst | Spring Pre-Plant 100 L/ha | Hectares | | | | | | 150 | 150 | | | | | | 300 |
| B1 | F22-FF26 | Bathurst | Autumn Pre-plant100 L/ha | Hectares | | | | | | | | | 917 | 916 | 917 | | 2750 |
| B1 | F22-FF26 | Bathurst | Post Plant 60 L/ha | Hectares | | | 917 | 916 | 917 | | | | | | | | 2750 |
| B1 | F22-FF26 | Bathurst | Wattle Post Plant 60 L/ha | Hectares | | | | | 125 | 125 | | | | | | | 250 |
| Work parcel | Financial Year | Region | Program | Hectares | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Total |
| N1 | F22-FF26 | Walcha | Pre Plant 100L/ha | Hectares | | | | | | | | 700 | | | | | 700 |
| N1 | F22-FF26 | Walcha | Post Plant 60 L/ha | Hectares | | | 233 | 234 | 233 | | | | | | | | 700 |
| N1 | F22-FF26 | Walcha | Wattle/Dothistroma/Other 5 L/ha | Hectares | | | | | 1200 | 300 | | | | | | | 1500 |
| N1 | F22-FF26 | Grafton | Spring Pre-Plant/ holding 100L/ha | Hectares | | | | | | 100 | 100 | | | | | | 200 |
| N1 | F22-FF26 | Grafton | Pre Plant 100L/ha | Hectares | | | | | | | | 180 | 720 | | | | 900 |
| N1 | F22-FF26 | Grafton | Post Plant 60 L/ha | Hectares | | | 300 | 300 | 300 | | | | | | | | 900 |
| N1 | F22-FF26 | Grafton | Wattle/Dothistroma/Other 5 L/ha | Hectares | | | | | 250 | | | | | | | | 250 |
| N1 | F22-FF26 | Grafton Hardwood | Pre Plant 100L/ha | Hectares | | | | | 650 | 650 | | | | | | | 1300 |
| N1 | F22-FF26 | Grafton Hardwood | Post Plant 60 L/ha | Hectares | | | | | 350 | | | | | 50 | 50 | | 450 |

| Work Parcel | Spray Volumes | Total Hectares |
|-------------|---------------|----------------|
| S1 | 100L/ha | 10,000 |
| S1 | 50-60L/ha | 6,600 |
| B1 | 100L/ha | 3,050 |
| B1 | 50-60L/ha | 3,000 |
| N1 | 100L/ha | 3,100 |
| N1 | 50-60L/ha | 2,050 |
| N1 | 5L/ha | 1,750 |

SCHEDULE 5 AERIAL APPLICATION OF PESTICIDES SERVICES REQUIREMENTS

Part 1

The Company must:

1. provide Aircraft and Equipment, including FCNSW and UHF radios, capable of loading and accurately and uniformly applying the nominated rates of Pesticide, with a maximum allowable Flight line separation of 14 metres, or other agreed separation. The Aircraft and Equipment is to be in good working order and fully maintained during the Term of the Agreement,
2. provide personnel and a vehicle suitable for the safe and effective transportation of water from a Designated Water Source to the Loading Site.
3. provide personnel and a vehicle suitable for the safe and efficient transportation of Pesticides and Pesticide containers, full or empty, between a FCNSW Chemical Store or a local chemical retailer and the Loading Site,
4. provide and transport signage appropriate for warning the public about the use of a helicopter for aerial spraying and landing in the area.
5. supply an employee who has a fork lift licence,
6. supply all equipment and labour to mix and load the Pesticide into the Aircraft. The Company shall only load and apply material supplied by FCNSW,
7. work the Aircraft continuously when meteorological constraints permit as directed by FCNSW for the Aerial Application of Pesticides (see **Schedule 6, Part 2**),
8. provide the following nozzles to perform the required tasks:
 - a. Micronair
 - b. Hydraluic
 - c. Accu-Flo
 - d. T-Jet
 - e. CP's
9. provide portable weather stations to monitor and record meteorological data within the Area to be Treated to meet the criteria of **Schedule 6 Part 2 Number 6** and make all such data available to FCNSW or to an independent auditor as required,
10. provide a competent and approved Pilot to operate the Aircraft at all times it is required by FCNSW and any other personnel necessary for the efficient operation of the Aircraft,
11. supply at their own expense all fuel (unless otherwise agreed by FCNSW), oil, grease, spare parts and anything else necessary for the continuous and satisfactory operation of the Aircraft,
12. repair promptly at their own cost any damage they cause to roads, tracks or fixtures on or adjoining the areas worked on, and
13. have a CASA accredited/approved fatigue management system in place. Pilots shall not exceed 12 hours duty time per day
14. provide written advice when an Area to be Treated has been completed. The advice, when submitted, must be accompanied by differential GPS data in a format as agreed to by FCNSW showing the Area Treated.
15. submit all GPS and weather data at the completion of the site.
16. The Company must advise FCNSW in writing at the commencement of each month of any intention to carry out repairs or maintenance on the Aircraft that will affect its availability for the Spraying tasks. As far as practicable all adjustments and repairs shall be carried out outside normal working hours.
17. The company must complete the task allocated by FCNSW during the allocated timeframes to achieve the works as per **Schedule 4 part 3**.
18. The Company must pay all costs of maintaining the Aircraft whilst working for FCNSW under this Agreement.
19. Tools and equipment to carry out necessary repairs shall be provided by the Company.
20. Should a primary aircraft become unavailable during the spray Season due to scheduled or unscheduled maintenance for a period of more than 48 hours FCNSW may ask the Company to arrange to have a suitable replacement Aircraft and Pilot available to carry out the spraying tasks whilst the maintenance is completed
21. Scheduled maintenance must be carried out at an agreed time between the company and FCNSW so as not to interrupt the planned spraying operations.

22. The Company must immediately notify FCNSW in writing of any reason the state of readiness of the Aircraft has been reduced or unavailable. Such reasons might include but are not limited to Aircraft un-serviceability, maintenance, pilot illness and duty time limitations.
23. The Company must have access to back-up support including suitably qualified relief pilots and "out of hours" servicing.
24. Should a primary aircraft become unavailable for a prolonged period, this Agreement may be terminated as it relates to this aircraft. FCNSW reserves all rights under this Agreement should this occur.
25. The Company shall be responsible for providing all facilities required to support the Aircraft and pilot at the Location, including, but not limited to communications, security, accommodation and maintenance facilities.
26. The Company shall use and have ready access to email, the Internet, and selected FCNSW computer systems at the Location.

Part 2

FCNSW must:

1. provide the Company within a reasonable timeframe the operations plans including maps, in hard copy and GPS format, of each area to be treated with Pesticide,
2. provide Aircraft landing areas as close as possible to the areas to be treated if required (landing pad trucks are to be used primarily), and
3. identify to the Company readily accessible Designated Water Sources with water quality suitable for use in mixing with Pesticides to meet the required Application Rate.
4. provide assistance with arrangements for Pilot accommodation and meals should the Pilot be required to operate away from the nominated bases. The Company is responsible for the costs of such accommodation and meals.

SCHEDULE 6 AERIAL APPLICATION OF PESTICIDES PROCEDURES AND SPECIFICATIONS

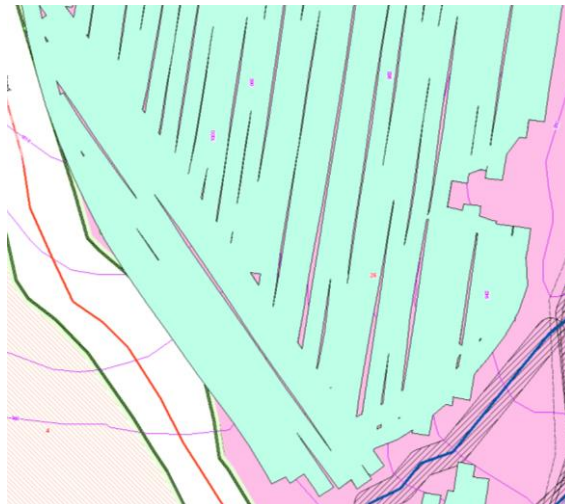
Part 1

- 1 FCNSW shall provide the Company an estimated area (hectares) planned for pesticide application as indicated in the FCNSW operations plan (Area to be Treated). This is to be verified by aerial reconnaissance and/or comprehensive briefing with the FCNSW Supervisor during the site inspection on the day of application and prior to commencement. This estimated area may be impacted if operational exclusions are applied.
- 2 FCNSW issues the Company with operational maps showing the Area to be Treated. Maps will show, where possible, all planned environmental exclusions, Protective Buffers and No Spray Areas.
- 3 The Company and FCNSW Supervisor must conduct a site inspection on the day of operation prior to commencement to confirm Area to be Treated. This inspection may result in additional areas being excluded from the Area to be Treated; for example, a wet depression or standing water that was not evident at time of planning, or additional buffering on a neighbouring property given the wind direction at the time. Exclusions are to be noted in the operational plan Green Light Checklist.
- 4 Pesticide is applied to the Area to be Treated as per the plan conditions.
- 5 Upon completion of the operation, the Company provides Flight line data to FCNSW as per clause 5 in Part 2 - Specifications.
- 6 The Flight line data showing periods when product was being applied, is converted to the relevant FCNSW GIS projection and overlaid onto the operational map.
- 7 If the data is provided in a line format (as opposed to a polygon or 'brick' format), FCNSW applies an appropriate buffer to the line which reflects the nominated effective swath width of the spray application, thereby converting the lines to polygons (for example, if the swath was 12m, then a 6m buffer both sides of the line would be applied).
- 8 FCNSW aggregates the Flight line data using the 'dissolve' tool on the FCNSW GIS. This tool combines all individual 'bricks' of spray and removes any areas of overlap (refer figures 1 and 2 below). Note: this means that any areas where the spray has overlapped will only be included in the Area Treated once, and any patches not treated will not be included in the Area Treated.

Figure 1: Flight line data (before being dissolved)



Figure 2: Flight line data (after being dissolved)



9. FCNSW assesses:
 - a. Whether any area was treated outside of the Area to be Treated
 - b. Whether any area identified as Protective Buffer or No-Spray Area was treated (Note: both instances may warrant further investigation.)

10. Areas that constitute 9a and 9b above will be removed from the data set, thus the Area Treated (ha) is created.
11. FCNSW provides the Company with the Area Treated figure for each site to the nearest one tenth hectare, and provides a map of the dissolved Flight lines overlayed on the operational map (as per Figure 2 above).

Part 2 - Specifications

1. CONTROL OF OPERATIONS

- a) The Supervisor shall act as or nominate a Controller of Operations (Controller) for each operational site.
- b) The Controller will plan and co-ordinate all aspects of the Pesticide application operation, and shall ensure that the Work is carried out to specification.
- c) The Company will nominate a representative who will liaise closely with the FCNSW Controller.
- d) FCNSW will provide the Company with a map and written plan showing the Area to be Treated, sensitive boundaries, watercourses and any hazards to flying, and specifying treatments to be applied. A copy of the Material Safety Data Sheet for each product being applied should be attached to the plan.
- e) FCNSW's Controller may at any time suspend operations if they believe that prescriptions or specifications are not being met.
- f) Two way radio communication between the aircraft and the FCNSW Controller must be available.

2. IDENTIFICATION OF TARGET AREAS

No Pesticide application shall commence until the Area to be Treated is correctly and unambiguously defined and identified by the Company's representative and Pilot. This shall be achieved through an appropriate combination of;

- a) comprehensive Pilot briefing and;
- b) reconnaissance flights.

3. LABEL DIRECTIONS

It is an offence to apply any Pesticide in a manner contrary to the registered label, or if applicable, off-label permit issued by the Australian Pesticides and Veterinary Medicines Authority (APVMA).

The Company must ensure that their employees understand label or permit directions and that all Pesticide is applied according to these directions.

4. APPLICATION EQUIPMENT AND CALIBRATION

- a) The Company must supply acceptable calibration data from an independent testing agency acceptable to FCNSW showing that the Equipment and calibration to be used for the Services is capable of applying Pesticide at the appropriate rate, spread uniformity and optimum Flight line separation and swath width, with a maximum coefficient of variation (COV) of 30% in volume or 15% in weight applied. Calibration data must be provided prior to operations commencing for each combination of application volume and nozzle configuration used during the Term.
- b) FCNSW may suspend operations if checks reveal a COV greater than these limits measured across the Flight lines.
- c) The Aircraft and Equipment must be fully decontaminated before arrival at the Loading Site. Cleaning of the Aircraft or Equipment is only permitted on Loading Sites when approved by the Supervisor.

5. FLIGHT LINE NAVIGATION

- a) The Company shall supply a satellite differential GPS guidance system capable of allowing accurate and consistent navigation of Flight lines within 2 metres of a desired centre line.
- b) Flight line information should if possible include plots of the Flight lines outside of the treatment area, and show periods when product was being applied. This data should be available in digital form compatible with FCNSW Geographic Information System.
- c) Invoices must be accompanied by computer-generated Flight line printouts along with all GPS data as detailed in clause 5b), for all areas treated.

6. METEOROLOGICAL CONSTRAINTS

Pesticide should only be applied under the following meteorological conditions and as per the product label and permit requirements. The latter take precedence if they further constrain the operational meteorological envelope than the range stated below;

Follow label/ off-label permit conditions at all times. **If there are no weather conditions listed on the label;**

- Winds must be steady in direction, away from sensitive areas, greater than 2-4km/hour, but must not exceed 12 km/ hour for herbicide applications.
- Operations should cease in gusty or variable winds.
- Spray with cross wind where adjacent to a sensitive area.
- The maximum allowable temperature is 28°C.
- ΔT^1 (delta T) is not to be greater than 8° except when using **Accu-Flo** nozzles. Where Accu-Flo nozzles are being used, a ΔT of 12 is the maximum²
- Rainfall as agreed between FCNSW Controller and Company representative.

Operations Plans must specify allowable meteorological conditions for the operation

7. FLYING CONSTRAINTS

- a) All application shall attempt to be carried out at no more than 3 m above canopy, unless conditions make this height unsafe, or FCNSW Controller agrees to a greater height of application. The Pilot is the final judge of flying safety.
- b) Pesticides shall not be applied any closer than 150 metres horizontally from any dwelling, school premises, factory premises or other public place without written consent of the occupier or person in charge of the premises.
- c) Aircraft shall not be operated within 100 metres vertically or horizontally of an occupied building without the occupier's permission.
- d) Aircraft operations must not create disturbance in public areas, for example on roads or close to public gatherings.

8 STANDARD OF TREATMENT, PAYMENT AND RETENTION

- a) An area will be assessed as being treated to specification for the purposes of full payment if all parts of that area have evidence of treatment, i.e. visible weed yellowing or wilting associated with post-emergent herbicides.
- b) If unable to determine whether treatment has been satisfactory, FCNSW may elect to withhold a Retention Amount on each invoice in accordance with **clause 7.2** of the Agreement.
- c) If the treatment does not meet these standards, Forestry Corporation may direct the Contractor to rework the areas, including the supply of herbicides by the Contractor.

¹ Difference between dry and wet bulb temperature

² Refer advice from Dr Andrew Hewitt, University of Queensland (TRIM D00186241)

SCHEDULE 7 SAFETY MANAGEMENT & RECOMMENDED OPERATING PROCEDURES

The procedure outlined herein covers the safety management and general operating procedures for the delivery of aerial application of pesticides and fire-fighting services by the Company to FCNSW.

1. Definitions

In the interpretation of this Schedule the following words and expressions shall, unless inconsistent with the context or subject matter, have the following meanings:

“Contractor Site” means the area in which the work pursuant to this Agreement will be performed.

“Contractor Risk Controls” has the meaning given to that term in clause 3(d) of this Schedule.

“ISO” means any applicable international standards as established by the International Organisation for Standardisation, which is the body that develops and publishes the international standards.

“Lost Time Incident” means an incident during the performance of this Agreement where a worker suffers injury or illness which results in at least one full work day/shift being lost after the day on which the injury occurred.

“Medical Treatment Incident” means an incident during the performance of this Agreement where a worker is injured and requires professional medical treatment.

“Near Miss” means an unplanned incident that occurs which does not result in injury or disease although it had the potential to do so

“Notifiable Incident” means:

- a. an act or omission which is required to be notified to the relevant work health and safety regulator or mines regulator in accordance with WHS Laws.
- b. Any incident involving the rolling over or overturning of any plant, vehicle or trailer comprising part of the Equipment or other equipment used by the Contractor in the performance of this Agreement and whether or not it is an act referred to in paragraph (a) of this definition.

“principal contractor” has the same meanings given to that term under the Work Health and Safety Regulation 2017 (NSW).

“Reportable Incident” means a Loss Time Incident, Medical Treatment Incident or a Near Miss which is not a Notifiable Incident.

“Safety Management System” means a documented system for the management of all matters relating to Work Health and Safety including induction records, emergency procedures, inspections, consultation, training programs, incident reporting, accident records, safe working systems, hazard management and performance monitoring. Specifically the system must be in accordance with relevant Australian or International Standards for Safety Management for example AS4801 and the WHS Laws.

“WHS Laws” means:

- (a) Work Health and Safety Act 2011 (NSW), as amended from time to time;
- (b) Work Health and Safety Regulation 2017 (NSW) as amended from time to time;
- (c) Work Health and Safety (Mines and Petroleum Sites) Act 2013 (NSW), as amended from time to time;
- (d) Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 (NSW), as amended from time to time
- (e) any Australian Standards and any ISOs that are applicable and relevant to any work performed pursuant to this Agreement;
- (f) any Codes of Practice that are applicable and relevant to the work performed pursuant to this Agreement; and
- (e) any other obligations imposed or standard prescribed by any other Act, Regulation, Australian Standard, Code of Practice, Order, or any other instrument creating legal obligations or prescribing standards relevant to work performed pursuant to this Agreement.

“WHS Plan” means a plan prepared in accordance with clause 3.5 of this Schedule

“WHS Risk Register” means a register of the WHS risks identified at the Contractor Site, along with the inherent risk rating, current controls and residual risk ratings.

“Worker” has the meaning given to that term in the Work Health and NSW Safety Act 2011 (NSW)

“workplace” has the same meanings given to that term under the Work Health and Safety Act 2011 (NSW)

2. Contractor Obligations

2.1. General

Without limiting its obligations under this Agreement, the Contractor must at all times comply, and must ensure that its subcontractors and any other person engaged by the Contractor for the purpose of this Agreement complies, with the WHS Laws.

All Company personnel are to be provided with a copy of **Schedule 7 – The Safety Management and Recommended Operating Procedures**.

Pilots and crew involved in the operation are required to be made aware of and understand the applicable requirements of Low Level and Minimum Altitude operations as set out in **part 8 of Schedule 7**.

The pre-flight risk management assessment used in this **Schedule 7, Section 9**, is taken from CASA Safety Management System guidance material publications.

2.2. Management and Control

The FCNSW authorises the Contractor to manage and control each Contractor Site during the Term except in circumstances where it is agreed by the parties in writing that FCNSW resumes back the management and control of the Contractor Site on a temporary basis.

2.3. Warranty

The Contractor represents and warrants that:

- a) it has given careful, prudent and comprehensive consideration to the work, health and safety implications of the work to be performed by it pursuant to this Agreement; and
- b) the proposed method of performance of that work complies with, and includes a system for identifying and managing work, health and safety risks which complies with the WHS Laws

3. Safety Management Systems

3.1. Hazard Identification, Site Risk Assessment and Control

The Contractor:

- a) must maintain and apply a Safety Management System which must as a minimum comply with all WHS Laws applicable to the Contractor;
- b) must provide copies of documents recording the Safety Management System to FCNSW if requested;
- c) must do all that is reasonably practicable to ensure that its subcontractors and any other person engaged by the Contractor do not, at any time, cause FCNSW to be in contravention of a WHS Law or any other law;
- d) acknowledges that, as at the commencement of the Term, it has systems (including the Safety Management System), processes, practices and procedures in place which address and mitigate the risks involved in the performance of work pursuant to this Agreement ("Contractor Risk Controls");
- e) during the Term maintain and apply the Contractor Risk Controls.

3.2. Where a hazard is identified

When the Contractor discovers a new hazard to work, health and safety at the applicable Contractor Site that is of sufficient concern that it is proposed to add it to the WHS Risk Register, the Contractor shall:

- a) immediately notify the FCNSW Representative, detailing the hazard;
- b) follow all instructions and directions of the FCNSW Representative; (if any) and take all reasonable steps to eliminate or minimise the risks to health, work and safety associated with the identified hazard; and
- c) provide to the FCNSW Representative within 10 working days of discovery of the hazard, details of any updates to the Safety Management System or Contractor Risk Controls which identifies the hazard and describes the risk mitigation strategies necessary to address the related work, health and safety risks.

Nothing in clause (b) or (c) is intended to derogate from the management and control of the Contractor Site conferred upon the Contractor. The Contractor acknowledges and agrees FCNSW may give directions to address work, health and safety issues which arise from time to time at the applicable Contractor Site where it has a legitimate interest, having regard to its own obligations as a "person conducting a business or undertaking" pursuant to WHS Laws, in doing so.

3.3. Training, Competency and Licensing

The Contractor shall:

- (a) ensure that if the WHS Laws require that:
 - (i) a person:
 - A. be authorised or licensed (in accordance with the WHS Laws) to carry out any work at the workplace, that person is so authorised or licensed and complies with any conditions of such authorisation or licence; and/or
 - B. has prescribed qualifications or experience or, if not, is to be supervised by a person who has prescribed qualifications or experience (as defined in the WHS Laws); or
 - (ii) a workplace, plant or substance (or design), or work (or class of work) be authorised or licensed, that workplace plant or substance, or work is so authorised or licensed;
- (b) not direct or allow a person to carry out work or use plant or substance, at a workplace unless the requirements of subparagraph (a) are met (including any requirement to be authorised, licensed, qualified or supervised); and
- (c) if requested by FCNSW, or required by the WHS Laws, produce evidence of any approvals, certificates, authorisations, licences, prescribed qualifications or experience, or any other information relevant to work, health and safety (as the case may be) to the satisfaction of FCNSW before the Contractor or its subcontractors or any other person engaged by the Contractor for the purpose of this Agreement commence such work.

3.4. WHS Inductions

- (a) The Contractor shall ensure that any Workers of the Contractor, its subcontractors, any other person engaged by the Contractor for the purpose of this Agreement and any FCNSW Workers who will perform work on the Contractor Site:
 - (i) participate in safety-related induction training or site induction briefings provided by the Contractor for the Contractor Site; and
 - (ii) participate in any additional safety-related induction or site induction briefings, as required, provided by FCNSW.
- (b) The Contractor shall ensure that all persons attending the safety related training or site induction briefings sign an attendance form and a site safety induction form where applicable.

3.5. Site Management

The Contractor will develop a WHS Plan, or endorse one prepared by FCNSW that addresses the following matters:

- (a) the names, positions and health and safety responsibilities of all persons at the workplace whose positions or roles involve specific health and safety responsibilities in connection with the work performed pursuant to this Agreement;
- (b) the arrangements in place between any person conducting a business or undertaking at the Contractor Site, for consultation, corporation and co-ordination of activities in relation to compliance with their duties under WHS Laws;

- (c) WHS risk management through:
 - (i) appropriate methodologies;
 - (ii) WHS Risk Registers;
 - (iii) processes and practices to manage specific hazards identified in the WHS Risk Register and Contractor Risk Controls; and
 - (iv) safe work method statements.
- (d) the arrangements for the collection and any assessment, monitoring and review of safe work method statements at the Contractor Site;
- (e) hazard and incident reporting, investigation and management;
- (f) induction, training and competency;
- (g) any Contractor Site specific health and safety rules, and the arrangements for ensuring that all persons at the Contractor Site are informed of those rules;
- (h) emergency management;
- (i) first aid;
- (j) inspections and housekeeping;
- (k) audits;
- (l) document management and control;
- (m) contractor management;
- (n) management of change;
- (o) management review;

when work pursuant to this Agreement is being performed at the Contractor Site how:

- (a) public access to the Contractor Site will be prevented;
- (b) public access through a Contractor Site, when necessary will be enabled and controlled;
- (c) construction traffic (pedestrian and vehicular) will be controlled at its interface with public traffic;
- (d) appropriate amenities are made available;
- (e) risks associated with electricity supply are managed;
- (f) risks associated with exposure to the elements are managed;
- (g) adequate light is provided; and
- (h) risks associated with existing services are managed.

3.6. Consultation Co-operation and Co-ordination

FCNSW and the Contractor:

- (a) shall, where applicable, comply, and the Contractor shall ensure that all Subcontractors and any other person engaged by the Contractor for the purpose of this Agreement comply, with the obligation under the WHS Laws to, so far as is reasonably practicable, consult, co-operate, and co-ordinate activities with FCNSW, the Contractor or the Subcontractors (as the case may be) and any other person who, concurrently with FCNSW, the Contractor or the Subcontractor (as the case may be) has a work health and safety duty under the WHS Laws in relation to the same matter; and
- (b) acknowledge that they have a duty under the applicable WHS Laws to ensure, so far as is reasonably practicable, the health and safety of all Workers performing any work related to, or in connection with, this Agreement including but not limited to:
 - (i) FCNSW Workers;
 - (ii) Contractor Workers and Subcontractor Workers; and
 - (iii) other persons in connection with work performed pursuant to this Agreement.

3.7. Reporting Incidents

- (a) The Contractor must notify FCNSW:
 - (i) immediately of any Notifiable Incident; or
 - (ii) Within twenty four (24) hours of a Loss Time Incident, Medical Treatment Incident or a Near Miss which is not a Notifiable Incident.
- (b) Within seven (7) days of a Reportable Incident, the Contractor must forward a report of the incident and if requested by FCNSW an incident investigation report as soon as reasonably practical. FCNSW may request to participate in or observe the Contractors investigation or undertake its own investigation. The Contractor must assist FCNSW to complete its own investigation.
- (c) The Contractor shall in accordance with the WHS Laws report to the relevant work health and safety or mines regulator any Notifiable Incident that involves:
 - (i) Contractor or Subcontractor Workers on Contractor Site;
 - (ii) FCNSW Workers on Contractor Site; or
 - (iii) Contractor or Subcontractor Workers on FCNSW property outside the Contractor Siteprovided that the Contractor must consult with and accept the assistance of FCNSW in the reporting process if FCNSW elects to become involved.
- (d) The Contractor shall in respect of any such Notifiable Incident:
 - (i) comply with its duty to preserve the incident scene until further directions are provided by the relevant work health and safety or mines regulator;
 - (ii) immediately provide FCNSW with a copy of the notice required to be provided to the relevant work health and safety or mines regulator;
 - (iii) undertake and complete an investigation into the Notifiable Incident as soon as reasonably practical after notification to the relevant work health and safety or mines regulator;
 - (iv) promptly provide FCNSW with a copy of the investigation report relating to the Notifiable Incident upon completion of such investigation;
 - (v) promptly provide FCNSW with copies of any notice(s) or other documentation issued by the work health and safety or mines regulator; and
 - (vi) as soon as reasonably practical after the date of notification to the relevant work health and safety or mines regulator, provide FCNSW with a summary of the related investigations, actions taken and any impact on the performance of work pursuant to this Agreement that may result from the Notifiable Incident.

4. Contractor Site Access

The Contractor shall give and ensure that its subcontractors and any other person engaged by the Contractor gives the FCNSW and any person authorised by FCNSW access to:

- (a) Any Contractor Site to conduct site inspections for the purpose of monitoring the Contractor's or any subcontractor's (as the case may be) compliance with WHS Laws; Safety Management Systems, Contractor Risk Controls and WHS Plan; and
- (b) all internal and third party audit results in relation to work health and safety in relation to performed under this Agreement.

5. Compliance with FCNSW Policies

The Contractor must at all times comply, and must ensure that its subcontractors and any other person engaged by the Contractor for the purpose of this Agreement complies with all FCNSW policies of which it has been made aware and that are applicable to any work performed pursuant to this Agreement.

6. Indemnity

To the extent not prohibited by law, the Contractor indemnifies FCNSW against any claims, or any loss suffered or incurred by FCNSW arising out of or in connection with the failure of the Contractor, or any subcontractors or other persons engaged by the Contractors, to discharge the duties imposed under WHS Laws or otherwise comply with its obligations under this Schedule.

7. Personal protective equipment

The Contractor must ensure that all persons engaged use approved protective clothing and equipment, including;

- Heavy duty lace-up work boots providing ankle support with rubberised, heat resistant sole
- Hearing protection, when applicable;
- High visibility vest or clothing when exposed to hazards such as moving traffic, plant or equipment;
- Any safety belt fitted to the equipment;
- Sun cream where there is a sunburn risk;
- Any other safety equipment specified by the Supervising Forest Officer (SFO) or specified within the operational plan.
- The Contractor is responsible for identifying appropriate clothing and equipment as relevant to the work being conducted.
- The Contractor is responsible for ensuring all workers wear and use all required protective clothing and equipment.

8. LOW LEVEL & MINIMUM ALTITUDE OPERATIONS

During Low Level & Minimum Altitude operations the pilot needs to understand that certain environmental factors demand a higher standard of flying ability, self restraint and decision making qualities, all of which must be displayed during conditions that are more difficult than when flying at normal safe altitudes.

Surveys of the area are vital for the safe conduct of operations. The terrain whether mountainous, hilly, deep valleys, together with natural and manmade (towers, wires) obstacles, demand close study. Pilots shall obtain and study topographical charts for the intended area of operations and shall pay particular attention to and highlight the location of obstacles that maybe hazardous to the intended operation.

During the operation maintain a constant look-out for objects such as dead trees, telephone and power lines, masts, towers and aerals (all of which are difficult to see against the landscape), large birds of prey and/or flocks of smaller birds particularly in the early morning and late afternoon periods, or if in the vicinity of any place such as wooded hilly areas, water holes, permanent camp sites, etc. that are likely to attract birds.

In association the weather plays a significant role; visibility, wind direction and velocity, mechanical turbulence, wind shear, down wind turbulence and eddies near the edges of hills and ridges, calls for a clear plan that makes a proper assessment of these factors.

The pilot must be constantly aware of the direction and speed of the surface wind and the possibility of encountering differing local winds, downdraughts, etc. caused by contrasting terrain features.

Pilots must be aware that at Low Level &/or Minimum Altitude there is a tendency to concentrate vision too close to the aircraft which leads to a lack of awareness of obstructions, high ground or lowering cloud base further ahead.

Pilots are reminded of false visual impressions, such as “false horizon” with rising ground, and the difficulty of height keeping.

Care should be exercised when rising ground is encountered, that it does not exceed the maximum climbing performance of the particular aircraft. Under no circumstances must the pilot attempt to out-climb sharply rising terrain.

Pilots of helicopters are reminded that the chosen airspeed to be used during Low Level operations must allow for a margin that is above the low speed flight characteristics such as in unanticipated tail rotor yaw and the relative winds that fall within certain azimuths and speeds.

Pilots of helicopters are reminded of the Height-Velocity Envelope found in the A F M (Aircraft Flight Manual) and to be aware of the limitations it imposes when operating at low level.

When other aircraft are involved in the operation, close attention to the aircraft speed and configuration to be adopted during the operation is important, so that lateral space between aircraft is maintained, at safe speeds that cater for density, and reduced visibility including smoke and airborne ash particles.

In all instances other than when over flat terrain, it is recommended that the pilot adopt the same technique as for flight in bad visibility and reduce airspeed to the lowest safe cruise speed applicable to that aircraft, and to remain in sight of land or water at all times.

Pilots are to be aware of the danger of disorientation in the conditions of poor visibility associated with bushfires. They are also to be aware of the effect of extreme turbulence associated with operations in the vicinity of bush fires.

The pilot could also fall victim to the illusions created by drift near the ground when the surface wind is other than light and variable. Remember that:

- Flying into wind will produce a noticeable reduction in ground speed;
- When flying an aeroplane downwind under certain conditions, the increase in ground speed may be so noticeable that the pilot could be tempted to reduce indicated airspeed with disastrous results;
- When the wind is strong enough to produce a drift, turns are deceptive. For example when turning downwind from into wind, the aircraft gives the impression of slipping-in; and when turning into wind from downwind, the aircraft appears to skid out.

NOTE: Low level turns must always be correctly executed in spite of the deceptive appearance of the ground (although the drift is real) and because of this phenomenon, the pilot must be especially careful to allow sufficient room when turning from downwind to into wind in a confined manoeuvring area

Pilots will find it paramount to maintain a high level of anticipation and awareness when operating at Low Level &/or Minimum Altitude. Before descending to conduct Low Level &/or Minimum Altitude operations, the pilot in command shall conduct a reconnaissance of the area and identify the hazards noted from the study of the charts, and make a note of other hazards not indicated on the charts.

Before descent into the operational area the following check should be performed.

H – Height reference of operating area, Altimeter, Area Q N H, Radio altimeter.

A – Airspeed, Airframe, and System configurations.

S – Security of loose articles, Harnesses, Review Safety Plan and Emergency Actions.

E – Engine T's & P's, Fuel.

L – Location of Obstacles, Terrain features, and Safe Landing Zone.

L – Lookout for aircraft traffic.

It is the pilot's responsibility to control the aircraft and ensure that the maximum degree of safety is maintained throughout all phases of the operation, therefore, the pilot may cancel or terminate a flight at any stage if he/she considers that it is not prudent to continue due to adverse weather or other factors affecting safety.

9 Pre Flight Risk Assessment

| Contractor: ; Location Of Operation: ; Operational Role: Low Level Survey | | | | | |
|---|---|---|---------------------------------|--|---|
| Date: / / ; Reviewed & Accepted By: ; Position/Company: : | | | | | |
| ID | Section A Breakdown of Operation into Activities | Section B Hazard Identification (What can cause harm or damage) | Section C Risk Assessment | Section D Risk Control (What can be done to eliminate risk?) | Section E Action (Who will make sure this happens?) |
| 1 | Briefing of Survey Crew | Survey Crew not working as a team Injury caused by not following procedures | 3 | Pilot in command to conduct full safety brief with all personnel involved with the operation including correct procedure in an emergency, lookout for hazards. | Pilot in command, Survey Crew |
| 2 | Passenger Embarkation | Exposure to downwash & noise; potential for people to get struck by rotor system; Dust in eyes. | 3 5 3 | All Passengers to be briefed prior to approaching aircraft. Aircraft to be stationary and not running for loading as often as possible. Try to land downwind of people waiting to be picked up. | Pilot in Command |
| 3 | Land Site Selection – Loose Objects | Flying dust, sheet metal, plastics, farm equipment | 5 | Landing area to be sterile of loose objects within a 25 metre diameter, try to choose least dusty site. | Pilot in Command |
| 4 | Landing Site Selection – Personnel | People wandering across landing area creating hazard | 5 | Pilot to choose landing site with regard to inadvertent access by persons or animals not familiar with helicopter operations, ie children, landholders, pets, stock. | Pilot in Command |
| 5 | Landing Site Selection – Hazardous Objects on ground | Fence posts, fence wire, shrubs | 5 | Pilot to keep approach deliberately slow and come to a hover to ascertain a clear touchdown point. | Pilot in Command |
| 6 | Landing Site Selection – Power lines | Power line strike | 5 | Pilot to conduct a minimum 2 circuits of intended landing site to ascertain power line hazards. Always be aware of the possibility of second or third wires and don't assume the first one spotted is the only one. Select a site well clear of wires keeping in mind a departure path will be required perhaps with additional weight on board. Verbalise visualisation of lines with crew on board. | Pilot in Command, Survey Crew |

NOTE! Only risk levels 3,4 and 5 need to be assessed
Section D (Risk Control)

loss

Level 5 (Catastrophic)
Level 4 (Major)
Level 3 (Moderate)

Level 2 (Minor)
Level 1 (Insignificant)

Death or permanently disabled or serious environmental risk & high financial loss
Extensive injuries, loss of operational capability, minor environmental risk, major financial loss
Medical treatment required, on site environmental risk contained with outside help, high financial loss

First Aid treatment required, onsite environmental risk immediately contained medium financial loss.
No injuries, low financial loss.

| Contractor: ; Location Of Operation: ; Operational Role: Low Level Survey | | | | | |
|---|---|---|---------------------------------|--|--|
| Date: / / ; Reviewed & Accepted By: ; Position/Company: | | | | | |
| ID | Section A Breakdown of Operation into Activities | Section B Hazard Identification (What can cause harm or damage) | Section C Risk Assessment | Section D Risk Control (What can be done to eliminate risk?) | Section E Action (Who will make sure this happens?) |
| 7 | Descent to Landing Site | Power line strike | 5 | Approach into wind maintaining a slower than normal forward speed and descent rate to allow for careful inspection of the approach path. This acts as a back up to the initial survey and may allow the crew to react if a wire was not picked up first time round. It also reminds the crew to expect to see wires. Verbalise 'Clear to descent below poer line height'. | Pilot in Command, Survey Crew |
| 8 | Low Level Survey | Power line strike | 5 | When required to descend for low level survey, conduct a thorough scan of the area to be searched from 200-300 ft and pinpoint all power lines within site. Verbalise visualisation of lines with crew onboard. Do not drift outside of area cleared until another higher reconnaissance has been accomplished | Pilot in Command, Survey Crew |
| 9 | Low Level Survey | Power line strike | 5 | Do not conduct survey through partially timbered country as poles are easily disguised; unless an even more thorough inspection has been carried out at above 200 t to 100% guarantee no lines through area. | Pilot in Command, Survey Crew |
| 10 | Low Level Survey | Power line strike | 5 | Do not be persuaded to conduct an incomplete power line survey after being assured from someone with local knowledge that no lines exist. | Pilot in Command |
| 11 | Low Level Survey | Power line strike | 5 | Always carry minimum P O B. (Pilot plus one crew member) | Pilot in Command, Survey Crew |

NOTE! Only risk levels 3,4 and 5 need to be assessed
Section D (Risk Control)

Level 5 (Catastrophic)
Level 4 (Major)
Level 3 (Moderate)
Level 2 (Minor)
Level 1 (Insignificant)

Death or permanently disabled or serious environmental risk & high financial loss
Extensive injuries, loss of operational capability, minor environmental risk, major financial loss
Medical treatment required, on site environmental risk contained with outside help, high financial loss
First Aid treatment required, onsite environmental risk immediately contained medium financial loss.
No injuries, low financial loss.

| Contractor: ; Location Of Operation: ; Operational Role: Low Level Survey | | | | | |
|---|---|---|---------------------------------|--|--|
| Date: / / ; Reviewed & Accepted By: ; Position/Company: : | | | | | |
| ID | Section A Breakdown of Operation into Activities | Section B Hazard Identification (What can cause harm or damage) | Section C Risk Assessment | Section D Risk Control (What can be done to eliminate risk?) | Section E Action (Who will make sure this happens?) |
| 12 | Low Level Survey | Power line strike | 5 | The recommended heights for survey are generally 100 ft A G L. This keeps the aircraft in the safe zones for better proportion of time. | Pilot in Command, Survey Crew |
| 13 | Departure from Remote Landing Site | Power line strike | 5 | A reverse of the approach. Slow and measured with more vertical than horizontal until above power line height. Never depart quickly without consideration of hazards. Always treat a departure as a confined area one until above 100 feet AGL. | Pilot in Command |
| 14 | Low Level Survey | Power line strike | 5 | PILOT AND CREW CAN BECOME DROWSY AND SIGNS OF FATIGUE ARE NOT ALWAYS RECOGNISABLE. Lapses in concentration are potentially catastrophic therefore it is advisable to land and revive the senses at regular intervals of every one to two hours. Ensure appropriate landing areas are used. ie in clear open spaces with good departure and approach paths available. | Pilot in Command, Survey Crew |
| 15 | Low Level Survey | Bird Strikes | 4 | Pilot and crew are to maintain awareness to the hazard of bird strikes. Birds of prey activity is heightened in the vicinity of bush fires. | Pilot in Command, Survey Crew |
| 16 | Search and Rescue | Radio Communication | 5 | The pilot in command is to maintain constant radio contact with Airservices Australia for S A R purposes on a regular time period basis. When flight plan change or locating to a new survey area takes place to contact and advise Flight Watch of those changes. | Pilot in Command |

NOTE! Only risk levels 3,4 and 5 need to be assessed
Section D (Risk Control)

Level 5 (Catastrophic)
Level 4 (Major)
Level 3 (Moderate)
Level 2 (Minor)
Level 1 (Insignificant)

Death or permanently disabled or serious environmental risk & high financial loss
Extensive injuries, loss of operational capability, minor environmental risk, major financial loss
Medical treatment required, on site environmental risk contained with outside help, high financial loss
First Aid treatment required, onsite environmental risk immediately contained medium financial loss.
No injuries, low financial loss.

SCHEDULE 8 INCIDENT REPORTING DOCUMENTS

| | |
|---|--|
| Details | |
| Company Name | |
| Person Completing Form | |
| Financial Year | |
| Month | |
| Safety Statistics | |
| Total number of employees for the month | |
| Total hours worked (including overtime) for the month | |
| Total No. of Lost Time Incidents | |
| Total No. of Medical Treatment Incidents | |
| Total No. of Notifiable Incidents | |
| Operational Statistics | |
| Total number of flying hours per month per aircraft: | |
| Total number of unavailable days and cause | |

| | | |
|---|-----------------|--------------------|
| Corrective Actions (Safety, Environmental, Other Compliance) | | |
| Issue | Action Required | Completed (Yes/No) |
| | | |
| | | |
| | | |
| | | |

Appendix 6: Aerial Application of Sprays and Solids to Forest Crops

Softwood Plantations Division



Photo courtesy of R Riepsamen 2013

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|---|-------------------------|--------------------------|
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| Document ID (TRIM): SPD: D00071268/ HFD: D00088958 | Issue date: August 2013 | Review date: August 2018 |

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Preface

Forestry Corporation of New South Wales (Forestry Corporation) is committed to the use of environmentally sensitive land management practices, and to best practice in forest management. To help meet these commitments, Forestry Corp. has prepared Code of Practice to provide general rules for the conduct of forest operations. The Code is supported by Manuals which provide more detailed instructions for specific operations.

The aerial application of agricultural chemicals is a valuable tool for maximizing forestry productivity. However, because of the greater release height and the presence of wingtip and rotor blade vortices, aerial application increases the risk, compared to ground application, of chemicals moving off-target. This unintended movement of chemicals may result in environmental pollution or damage to neighbouring crops of vegetation.

This risk is minimised by

1. an understanding of the factors involved,
2. good planning, and
3. compliance with this Appendix.

This Appendix provides information on the aerial application of fertilisers and herbicides and is to be used in conjunction with the [Manual for the use of chemicals](#)

It is designed as a guide to Forestry Corporation personnel who plan and supervise contract aerial application of fertilisers and herbicides. It is not intended to be a manual for aerial application. It sets minimum standards, but it is expected that all aerial application will be carried out by properly trained, licensed and experienced contractors, who will be responsible for carrying out operations safely and to specification.

It includes background information and rules for all situations where Forestry Corporation is supervising contract aerial application, including;

- Forestry Corporation's own plantation program within dedicated State forests and purchased land;
- Plantation establishment on leased freehold land or where Forestry Corporation has entered into a joint venture agreement with private landholders; or,
- Where Forestry Corporation's own resources and expertise are used to implement plantation establishment and maintenance operations as a consultant or contractor to private landholders.

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29. Aerial application in forestry

Agricultural chemicals (fertilisers and pesticides) are used in forestry to enhance site productivity and to control weeds, pests, and diseases. It is often more practical and efficient to apply these chemicals using aircraft, because of the difficult site conditions in forests, and the frequent need to treat large areas quickly.

30. Legal aspects

2.1 Licensing

There is both Commonwealth and NSW legislative requirements for applying pesticides and fertilisers by air. The Civil Aviation Safety Authority (CASA) is responsible for the Commonwealth legislation, while the Environmental Protection Authority (EPA) administer the NSW requirements.

Pesticides can be applied only from aircraft endorsed by the Civil Aviation Safety Authority (CASA) as suitable for agricultural operations. In addition, the NSW *Pesticides Act* prohibits the attachment of spray equipment to aircraft not endorsed for agricultural operations.

Before a pesticide can be applied from an aircraft, both the company (aerial operator) and the pilot must obtain an EPA³ licence. *Table 1 Licence requirements for aerial operations* explains the licencing requirements for aerial applications, and can also be used as part of the due diligence planning process.

Procedures

- Licenses must be sighted before work commences. This can be done at the *contract* phase rather than before each operation.
- Pilot qualifications should be sent through to the Region by the Contractor prior to work commencing. The Planner must document that they have sighted the appropriate licences.

³ Environmental Protection Agency

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a) **Table 1 Licence requirements for aerial operations**

| Tick Include expiry dates | From | Requirement | Description |
|------------------------------------|------|--|--|
| | CASA | Special Certificate of Airworthiness (CoAs) ⁴ | An aircraft cannot operate unless it has this certificate. Where aircraft have a designated special purpose (such as application of pesticides) the certificate will state this. |
| | CASA | Air Operator's Certificate (AOC) | <p>The AOC is a permission granted by CASA under the Sec 27 of the Civil Aviation Act to conduct commercial activities prescribed in regulation 206 of the Civil Aviation Regulations (CAR). Consequently, operating these commercial activities without an AOC is illegal and is punishable by law. It is required where you conduct aerial operations⁵</p> <p>All AOCs are issued for a specified term. To continue operating, an AOC holder must apply for, and be issued with, a new AOC prior to the expiry of the existing AOC.</p> |
| | CASA | Commercial Pilot Licence with an Agricultural Rating | <p>Passing the Commercial Pilot Licence (CPL) test and being issued with the licence entitles you to</p> <ul style="list-style-type: none"> • carry passengers for hire or reward, in association with a licensed air service operator • operate as a light aircraft charter pilot. • fly as pilot in command of single pilot aircraft or as co-pilot in multi-crew aircraft. <p>Before exercising the privileges of the licence, you must pass more stringent medical examinations in order to obtain a Class 1 medical certificate.</p> <p>In addition, the Agricultural Rating is required for crop spraying, for pest control and fertiliser spreading.</p> |
| | EPA | Company | Aircraft operators (persons or corporations owning the business) hold an aircraft (pesticide applicator) licence |
| | EPA | Pilot ⁶ | <p>Pilot (pesticide rating) licence⁷.</p> <p>To be licenced, both operators and pilots must be accredited under the <i>Spray Safe Accreditation Program</i>, conducted by the <i>Aerial Agricultural Association of Australia</i>.⁸</p> |

2.2 Insurance

All aerial applicator contractors must hold the following insurances;

⁴ <http://www.casa.gov.au/wcmswr/assets/main/rules/1998casr/021/021c06.pdf>, clause 4 & 6

⁵ http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90333

⁶ Pesticides Regulation, 2009, Part 2, 6(2)

⁷ Pesticides Act, 1999, S45(1)(a)

⁸ Pesticides Regulation, 2009, Part 2, 6(2)

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- **Workers Compensation Insurance** to give cover to the contractor and all his employees against any liability arising, under the [Workers Compensation Act, 1987](#) or other applicable legislation or award.
- **Public Liability Insurance** for a sum of at least \$20 000 000 in the joint names of Forestry Corp. and the contractor
- Chemical Legal Liability Insurance for a sum not less than \$50 000
Note: Chemical Liability Insurance does not cover any losses caused to Forestry Corp. during an operation (for instance, any damage caused by drift or the use of incorrect rates of chemicals)
- Approved Aviation Hull Insurance and Aviation Liabilities Insurance.

3.3 Forestry Corporation's training requirements - controller of operations

Forestry Corporation have training and experience requirements for those involved in the planning and supervision of aerial operations. These are documented in the [Manual for the use of chemicals](#)

A supervisor involved in the aerial application of pesticides and fertilisers must have attended a short course, The Centre for Spray Technology Application Research and Training, The University of Queensland⁹.

The ground controller will report to the overall supervisor. The ground controller should have AQF 4 training (minimum).

3.4 Pesticide Control Orders and Civil Aviation Orders

Pesticide Control Orders are made under the *Pesticides Act*¹⁰. They tend to specify the manner in which a pesticide may be used (including the equipment), climatic conditions, and where the pesticide may be used.

[Pesticide Order Air-1](#) issued under Section 38 prohibits the aerial application of pesticides within 150m horizontally from the boundary of any dwelling, school premises, factory or other public place without the written consent of the occupier or person in charge of the premises.

[Civil Aviation Order 20.21](#), issued by the Civil Aviation Safety Authority, prohibits the operation of an aircraft within 100 metres vertically or horizontally of an occupied building without the occupier's permission. In addition, operations must not create disturbance in public areas, for example on roads or close to public gatherings.

3.5 Pollution of water

The [Protection of the Environment Operations Act, 1997](#) (PEO Act) prohibits the pollution of any waters¹¹. This is combined with a very broad definition of the term 'pollute'. The Act defines *water pollution* as

- b) *placing in or on, or otherwise introducing into or onto, waters (whether through an act or omission) any matter, whether solid, liquid or gaseous, so that the physical, chemical or biological condition of the waters is changed, or*
- c) *placing in or on, or otherwise introducing into or onto, the waters (whether through an act or omission) any refuse, litter, debris or other matter, whether solid or liquid or gaseous, so that the change in the condition of the waters or*

⁹ Chapter 5, Manual for the Use of Chemicals

¹⁰ Section 38, Pesticides Act, 1999

¹¹ Section 120

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the refuse, litter, debris or other matter, either alone or together with any other refuse, litter, debris or matter present in the waters makes, or is likely to make, the waters unclean, noxious, poisonous or impure, detrimental to the health, safety, welfare or property of persons, undrinkable for farm animals, poisonous or harmful to aquatic life, animals, birds or fish in or around the waters or unsuitable for use in irrigation, or obstructs or interferes with, or is likely to obstruct or interfere with persons in the exercise or enjoyment of any right in relation to the waters, or

- d) placing in or on, or otherwise introducing into or onto, the waters (whether through an act or omission) any matter, whether solid, liquid or gaseous, that is of a prescribed nature, description or class or that does not comply with any standard prescribed in respect of that matter,*

and, without affecting the generality of the foregoing, includes:

- e) placing any matter (whether solid, liquid or gaseous) in a position where:*

- (i) it falls, descends, is washed, is blown or percolates, or*
(ii) it is likely to fall, descend, be washed, be blown or percolate,

into any waters, onto the dry bed of any waters, or into any drain, channel or gutter used or designed to receive or pass rainwater, floodwater or any water that is not polluted, or

- f) placing any such matter on the dry bed of any waters, or in any drain, channel or gutter used or designed to receive or pass rainwater, floodwater or any water that is not polluted,*

if the matter would, had it been placed in any waters, have polluted or have been likely to pollute those waters.

In addition to implementing all label requirements, Forestry Corporation implements a range of precautions to prevent pollution of waters, including

- use of helicopters rather than fixed wing aircraft,
- specifying use of drift reduction nozzles and encouraging the use of other drift reduction technologies
- the selection of favourable weather conditions beyond those that may be specified on the label.
- training
- rigorous planning
- active contribution to the Australian Plantation Forestry Industry Herbicide Research Consortium

3.5.1 Monitoring pesticide residue

As part of Forestry Corporation's obligations to not pollute water, each Region implements a monitoring program, as per Appendix 3 "[Water Sampling Procedure](#)", [Manual for the use of chemicals](#)

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3.6 Notification of neighbours

Forestry Corporation has a legal obligation to notify the public of its pesticide use¹². This is in addition to the commitments the organisation has made to be a good neighbour¹³.

In general, staff should be aware of neighbours 500m – 3km away based on

- Previous knowledge/ relationship (use your Regional Stakeholder List)
- Presence of sensitive areas (for a definition of a sensitive area, refer to the [Manual for the use of chemicals](#) (10.2.1))

Procedures;

Neighbours (those immediately adjacent to State forest) and other relevant stakeholders (see below) must be informed of the activity prior to the event, in line with the Pesticides Use Notification Plan.

31. Helicopters vs. fixed-wing aircraft

Both fixed-wing and helicopters have a place in forestry chemical application, and it is important to understand the advantages and disadvantages of each type when organizing application operations. Refer to Section 9 for further information.

The **advantages** of helicopters are;

- Loading areas can be located closer to the operation, reducing turn-around times, no need for extensive preparation (i.e. grading and maintenance, and control of landing areas), and allowing better environmental control of the operation by eliminating the need to fly over non-target areas.
- Helicopters are more maneuverable than fixed-wing aircraft. Helicopters are effective and safe to operate where country is steep, or obstructed with powerlines or standing trees, or where extra accuracy is required because of sensitive areas or susceptible crops. They have an increased ability to work around rather than over retained uncut forest structures and other within-block exclusions, and greater ability to apply to headlands or small “highlight” areas within spray blocks
- Slower application speeds enables a bigger droplet size, thereby reducing the probability and potential distance of herbicide excursions into non-target areas, and drift potential as the result of droplet fractionation through wind shear.

The **disadvantages** of using a helicopter are;

- lower payload capacity. This can make treatment costs uncompetitive with fixed-wing aircraft (especially for fertilizer application), and increases the number of loading events with a concomitant increase in risks associated with accidents or spillage
- The lifting capacity of most helicopters is not as high as commonly available fixed-wing aircraft, but this may be offset by being able to conduct operations closer to the treatment site.

¹² Pesticide Use Notification Plan

¹³ [P2010/11 - Good Neighbour Policy](#)

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- Helicopters travel more slowly between jobs than fixed-wing aircraft, and large jobs take longer to complete.

Procedures;

- Aerial application of herbicide must be carried out by helicopters only.
- Spray application must never be undertaken in the hover, since it is not possible to exert any control over the spray cloud and extensive contamination of the helicopter and off-target areas may occur (refer to "*aerodynamic effects of aircraft on spray patterns*").

32. Safety

Refer to [FCNSW Safety Management System](#).

In addition to safety advice that is applicable to chemical use in general, the following is applicable to aerial operations.

Note: these may be added to at any time and staff must check the intranet when planning an operation.

4.1 Safety Standards

- [CSS004 - Workplace Incident Notification & Reporting](#)
PPE

Hazardous substances

4.2 Safe work procedures

- [SWP 7.7 - aerial spraying using a helicopter](#)

Procedures

- Clean water, soap and washing facilities must be available at all sites where pesticides are loaded and mixed. Hands will be washed after finishing work, before eating, drinking, smoking or using the toilet¹⁴.
- Appropriate equipment will be in place for spill management and containment. All those involved will be able to implement the requirements of "*Responding to a chemical spill*"¹⁵

¹⁴ "Personal hygiene", [Manual for the use of chemicals M](#), page 72

¹⁵ Appendix 1, Responding to a chemical spill, [Manual for the use of chemicals](#).

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33. Reducing drift

Drift is one way chemical can move off-site. It is defined as;

*the physical movement of spray droplets (and their dried remnants) through the air from the nozzle to any non- or off-target site at the time of application or soon thereafter*¹⁶.

It doesn't include secondary movement of agricultural chemicals to non- or off-target sites caused by volatility, erosion, surface or groundwater transport or windblown soil particles that occurs after application¹⁷.

Drift cannot be eliminated all together. At best, movement can be reduced. As already stated, herbicide applied by air is more prone to drift. In terms of aerial application, factors affecting drift include;

- Droplet size (which is, in turn, affected by orifice size and type of nozzle, release height, air sheer, impact of boom length, air speed & turbulence)
- Wind speed and direction.
- Aircraft position (swath adjustment)
- Physical properties of the spray mix

Forestry Corporation influence these factors, and therefore minimise the risk of drift, by;

- using helicopters over fixed wing
- using as coarse a droplet size as possible (after considering the weed matrix and the chemicals available)
- understanding the impacts of wind speed and other weather parameters
- keeping release height as low as safely possible
- specifying equipment type and arrangement
- using no-spray zones¹⁸

Procedure;

Minimise the drift potential of **dust from fertiliser application** by the specification of particle size – more than 95% of the weight of the material should be in particles greater than 2mm.

5.1 No-spray zones and protection strips

Forestry Corporation uses no-spray zones to minimise the impact of spray drift. No spray zones are the distance between the closest point of chemical application and the nearest boundary of a site to be protected. They are a tool for collecting spray droplets that may otherwise drift on to sensitive areas.

The type, width and location of no spray zones will vary on the crop, the application method and the proximity and orientation of sensitive areas. The width is based on an

¹⁷ Refer to [Manual for the use of chemicals](#) Section 10.2 "Control of spray drift"

¹⁸ No-spray zones apply when the object or area at risk lies in the downwind direction at the time of application from the application area.

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assessment of spray drift risk linked to either human health, environmental risk or an international trade risk.

No-spray zones may be imposed by the APVMA where it considers that there is a risk to health, environment or international trade. It is an area in which direct application of the agricultural chemical is prohibited¹⁹. If the APVMA has imposed a no-spray zone, it will be on the label. Forestry Corporation may implement a no-spray zone in addition to label requirements using Table 2.5.2 or appropriate modelling.

The [Manual for the use of chemicals](#), Section 10.2.2 gives additional information on no spray zones.

Procedures;

- **Implement all label conditions.**

Where no instructions are given on the label, drainage features within an area being treated aerially must include a no-spray zone with the *minimum* widths indicated in Table 2 (triazines) and Table 3 (all other herbicides excepting triazines)

- Where there is no label requirement for a no-spray zone, consideration should be given to using an aerial spray drift model (e.g. AGDISP) to validate proposed no-spray zones
- Staff may choose to implement a wider no-spray zone than is mandated on the label. This decision would be based on the
 - Type of chemical (residual)
 - Likelihood of storms
 - How likely run-off is (i.e. is the ground steep, amount of ground cover)
 - Soil type (soils prone to leaching)
 - How moist the soils are when we apply the chemical
- Where possible, no-spray zones should be vegetated with trees & shrubs to maximise the capture of spray drift
- Chemicals must not be applied directly to no-spray zones
- Drift into no-spray zones must be controlled through the selection of favourable weather conditions and winds, suitable aircraft and spray equipment.
- **All sensitive boundaries** should be patrolled during aerial operations to check on visible drift, prevailing wind direction and strength. These observations should be documented.
- Human line markers must not be used.
- Observers must be equipped to communicate directly with the pilot.

¹⁹ APVMA, Operating Principles in Relation to Spray Drift Risk, 2008, p28

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g) **Table 2 The upwind 'no spray zone' when using triazines where none are indicated on the label**

| | |
|--|------------|
| Major water storages (e.g. Blowering Dam or a town water supply) | 100 metres |
| Rivers, drainage lines, internal dams and wetlands ²⁰ whether or not there is water evident | 20 m |
| Other areas where there is water evident (e.g. drainage depressions or locally saturated soils) | 20 m |
| Neighbours | 20 m |

h) **Table 3 The upwind 'no-spray' width for all herbicides (excepting triazines) where none are indicated on the label**

| | |
|--|------------|
| Major water storages | 100 metres |
| Areas where there is water evident including rivers, drainage lines, drainage depressions, internal dams and wetlands ²¹ | 20 m |
| Drainage lines where there is <i>no</i> water evident in | 5 m |
| Neighbours | 20 m |

5.2 Nozzles

To reduce drift, you need to decrease the chance for small droplets (<150-200µm). As droplet size decreases, the number of droplets prone to off-target movement increases. The type of nozzle is the first tool in trying to control droplet size, and there is a wide range available.

The [Manual for the use of chemicals](#) discusses different nozzles in some detail (chapter 8). Nozzles used in aerial application are similar in design to those used in ground spray rigs. The fundamental difference is that nozzles for aircraft need to have high volume output because of the higher operating speeds of aircraft²².

Some **labels** discuss nozzle type or droplet spectrum, and pressure settings. You must always follow the label direction. This allows the user to select many different nozzle and pressure settings. Use nozzles within their pressure boundaries.

²⁰ As defined by the Plantation & Reafforestation Code.

²¹ As defined by the Plantation & Reafforestation Code.

²² "Equipment setup for aerial application of liquid pesticides", Louisiana State University Ag Centre, July 2010

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Planners should work with the pilot to select a nozzle with a droplet spectrum suited to the type of pesticide you are applying. Select nozzles that produce the largest droplets, using the lowest pressure that will give acceptable coverage. Identify your priorities;

- better drift control?
- Best pressure range?
- Very low water volumes?

Typically, smaller orifices produce finer sprays. There are five types of nozzles available²³, but aerial operations must always use drift reduction nozzles and atomizers. These include;

- Accuflow
- Flat fans
- Hollow cones.

Other nozzles include

- CP nozzle
- Rotary atomizer (Micronair)

Procedure;

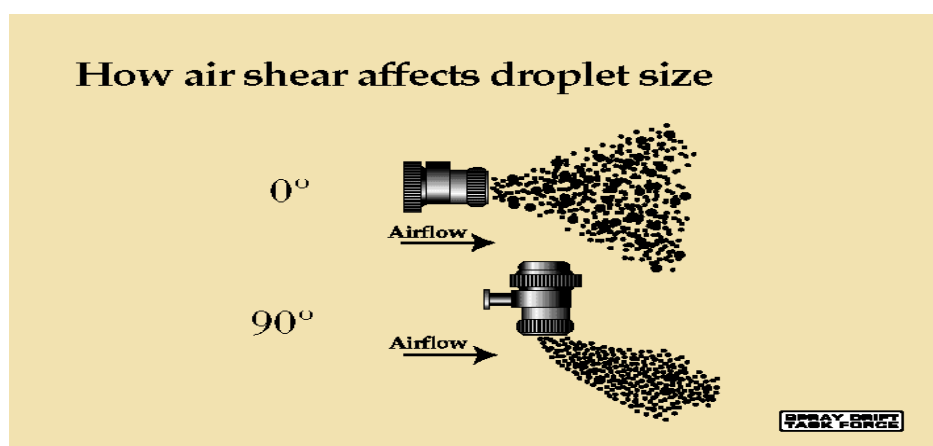
- Always use the nozzles within their pressure boundaries.
- Aerial herbicide operations must use drift reduction nozzles

For further information on nozzles, see Section 8.3

5.3 Air shear

Air shear is accentuated when applying pesticide from an aircraft, because of the air shear caused by the high-speed slipstream.

Nozzles angled forward and downward into the slipstream produce smaller droplets and a wider range of sizes than nozzles directed backward. 90° gives the smallest droplet size, 45° a middle range droplet size, and 0° (backwards) gives the largest droplet size.



²³ Information in this section is derived from a number of sources, but principally Wolf, T, " *Best Management Practices for Herbicide Application Technology*", Prairie Soils and Crop Journal, 2009

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6 Before you fly

There are certain elements that need to be confirmed before the operation commences.

6.1 Calibration

Calibration is the checking the settings of aircraft speed, track spacing, mix concentrations and flow rates to achieve the desired rates of active ingredient per hectare.

Given a track spacing to achieve optimum swath uniformity, and known aircraft speed, aircraft spray systems can automatically set liquid flow rates to achieve a desired carrier rate per hectare.

Procedure;

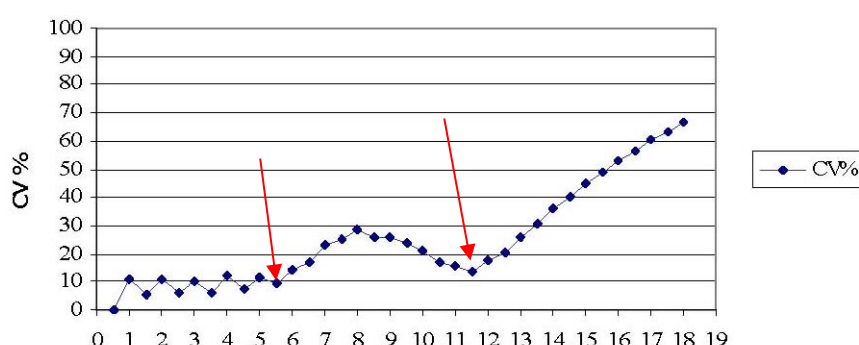
- Nozzles should be checked at least **once per season** and replaced if output is +/- 10% from that specified by the manufacturer
- Supervisors are to check the contractor's calculation of mixing rates, and monitor the quantities applied to known areas to ensure accurate rates of active ingredient per hectare. Note on the Operational Plan
- Spray equipment should have diaphragm check valves and should be checked regularly for leaks

6.2 Track spacing (also known as 'pattern testing')

The swath used by a helicopter is a function of the type of aircraft, flying height, droplet size and wind conditions at the time of spray. The best method to learn what is optimal swath width for a particular aircraft is to undertake pattern testing. Forestry Corporation ask for proof of pattern testing as part of the operation.

Effective swath width is narrower than the width of spray. Optimum track spacing is determined after analysing the spray is one half of the desired amount.

The coefficient of variation (COV) is a measure of the uniformity of the application. Generally, the lower the COV, the more uniform the deposition becomes.



i) Figure 1 Track spacing (m) measured against coefficient of variation²⁴

²⁴ Graph courtesy of "Managing aerial application of pesticides", S Gous and B Richardson, 2007

In this example, to achieve an acceptable coverage, the aircraft needs to fly consecutive flightlines at 6 metre or 12 metre intervals. In this case, you would choose a 6m swath for a hilly, or more complex, treatment area, and 12m for a straightforward, flat block.

Procedures;

- Track spacing should be set to give a maximum variation coefficient of variation (COV%) of rates across the swaths of 30% for liquid herbicides and 15% for solids.
- Contractors are required to produce evidence of field tests of swath uniformity.
- Spray booms are not to extend beyond the tip of the main rotor (recommend no more than 70%²⁵ but this will depend on the aircraft set up).

6.3 Airstrips and landing sites

All airstrips and helicopter landing areas should be inspected and approved by the pilot before operations commence. Refer 6.3.1 "*Helicopter landing areas*".

The following *principles* apply to both fixed-wing airstrips and helicopter landing areas;

- Elevated and close as possible to the application area
- Served by safe, all weather roads
- Loading sites should be firm, bunded if possible to contain spills, and distant from drainage features.

A grassed or sealed site is preferable to lessen dust problems. The loading site should be free from holes and flammable or loose materials. The surface must be able to support a fully laden aircraft and loading vehicle without sinking in.

- Free from landing and take-off obstructions.
- The direction of the wind at the landing point should be indicated by a method agreed to between the pilot and the ground controller (this may be as simple as ribbon tied to the car aerial)
- Where a helicopter is left overnight in the bush, it must be in a secure place (road closed).

Airstrips should be at least twice as long as the laden unsticking distance of the aircraft, 50 m wide (30m with 10m lateral clearance on each side) and preferably a ridgetop location, with minimal sideslope. It should be possible to drive a vehicle at 40km/ hr over the running surface with no discomfort.

6.3.1 Helicopter landing areas (HLAs)

These guidelines are from [Commonwealth Aviation Safety Authority \(CASA\)](#).

The location and design of helicopter landing Areas (HLAs) has a major impact on the safety of helicopter operations and environmental risks from the use of chemicals.

²⁵ Latest research suggests 59% gives noticeable decrease in change of spray drift (CPAS, Gatton, September 2011)

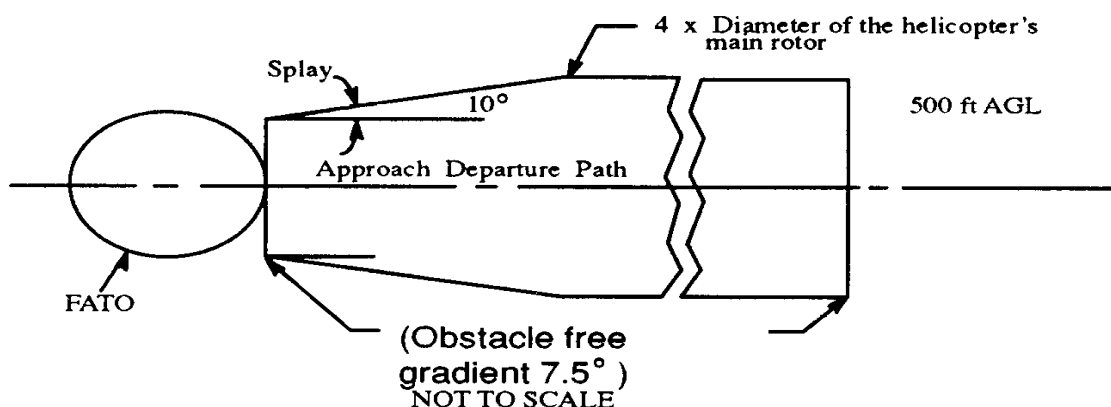
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Procedure

- Where possible, Helicopter Landing Areas (HLA) should be located and prepared before the operation.
- The pilot will check and approve each HLA prior to the operation.

- If possible HLAs should be located within the treatment area. A minimum intensity of 1 HLA per 750 hectares is recommended (maximum flying distance 1.5 – 2km from a central location).
- Loading sites must be located so as to minimise the risk of spills reaching drainage lines and watercourses
- No overflying of public roads or private property should be required during the application operation.
- 4 way road intersections make good HLAs. The [CASA Guidelines for the establishment and use of helicopter landing sites](#) give the recommended criteria for a basic Helicopter Landing Site (page 5)
- HLAs should be as high as possible. Hilltop locations are preferred.
- HLAs should be gravelled, with minimum slope, and should be served by an all weather road.



j) Picture courtesy of CASA CAAP 92(2) - Guidelines for the establishment and use of helicopter landing sites

Layout of HLAs

Helicopters fully loaded cannot take off straight up over obstructions, and require a flat area approximately 100m long and into the wind so that the helicopter gains flying speed. An open hilltop or high point or rise with a drop off into the prevailing wind is a good site. As with take offs, landings are also normally made into the prevailing wind.

- Helicopters need to take off and land into the wind.
- HLAs should have a minimum of 2 takeoff lanes, dependent upon normal prevailing wind direction.
- Ideally, takeoff and landing would be possible in any direction.
- Take off lanes should be a minimum width of 20 metres, and are to be clear of all obstructions (stumps, trees, big rocks etc) within this corridor for a minimum length of twice the length of the helicopter.
- The HLA should be higher than any obstruction within 250m in the direction of the takeoff lanes. The desirable minimum fall angle to the top of any obstruction within this distance is 3 degrees.

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- The loading site should be big enough to land the helicopter (20m minimum width) plus have space within hose distance for 2 tanker sized vehicles standing side by side.

6.4 Bunding and Sumps

Spills and washdown water should be retained within the HLA. There should be no chance of herbicides reaching drainage lines. Options include:

- Sloping HLA with fall into compartment area, with earth bunding and excavated sump with minimum capacity 500 litres on the bottom side. A carbon filter in the sump hole (charcoal recovered from burnt windrows for instance) improves retention of chemical on site.
- Hilltop location with temporary sandbag bunds on the table drains.

Reference: [CASA Guidelines for the establishment and use of helicopter landing sites](#)

7 Operational management

7.1 Planning of operations

All application of pesticides, fertilisers, and biosolids on State forest must be carried out in accordance with an Operational plan and appropriate 'due diligence'²⁶

The [Herbicide application - due diligence](#) must be used in the planning process, while the [Aerial herbicide operational plan template](#) is what goes out to the field for implementation.

7.1.1 Use of anti-evaporants, anti-drift and other spray adjuvants

Use of adjuvants in aerial operations requires knowing the physical properties of the tank mix as adjuvants can change the physical properties of droplets²⁷. Studies show that emulsion adjuvants (e.g. emulsified seed oil, Hasten™) produce ½ the fines than when using a solution surfactant while still getting the same 'sticking' on the leaf of the weed.

Polymers do not work when using a medium/ coarse nozzle

Do not rely on tank mix products advertised as 'drift retardants' as the data does not support the efficacy of these products²⁸.

Advice should be sought before using them unless they are specified on the label.

7.2 Spray modeling

Originally, modeling was driven by a need to improve the amount of sprayed material that actually deposited on a target area. A later focus has been to determine the amount of sprayed material that does not land on the target area ("drift").

²⁶ Chapter 10, Manual for the Use of Chemicals

²⁷ Aerial application technology in forestry short course, Centre for Pesticide Application and Safety, UQ (Gatton), September 2011

²⁸ APVMA Operating Principles in relation to Spray Drift Risk, APVMA, 2008, p 20

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The purpose of modeling is to predict the

- deposition pattern of material released from the aircraft (beginning after breakup of the nozzle stream into drops, through interaction with the aircraft wake and atmosphere),
- deposition through a canopy and
- onto the ground.

These models also predict the motion of spray material released from the aircraft, but do not replace the need for pattern testing. That is modeling also assessments of

- swath uniformity,
- optimum track width and
- minimum no-spray widths

to be carried out for defined combinations of aircraft, spray system, weather and spray material.

There are two models that are widely used in aerial forestry applications –

- i. AGDISP
- ii. AgDRIFT

k) Table 4 Differences between AGDISP & AgDRIFT

| | |
|---------|--|
| AGDISP | <p>NASA funds development of a model of aerial application. This becomes known as AGDISP. In 1982 the model got transferred to the US Forest Service.</p> <p>AGDISP is an evergreen model and will change with time. It evaluates</p> <ul style="list-style-type: none">• within-spray block deposition patterns of aerial pesticide applications.• Deposition off-site and downwind• AGDISP has a focus on forestry operations.• Includes models for wingtip vortices, helicopter downwash and forward flight, propellers, atmospheric crosswind, turbulence, vortex decay, evaporation, and ground and canopy deposition. |
| AgDRIFT | <p>Is based on work done for AGDISP</p> <p>Generally “set in stone” so it will not change.</p> <p>is the regulatory version of AGDISP, and includes aerial ground and orchard spray options</p> <p>Download for free</p> <p>http://www.agdrift.com/AgDRIFT2/DownloadAgDrift2_0.htm</p> <p>Includes ground and orchard models.</p> |

For aerial scenarios, AGDISP and AgDRIFT have been validated to 800m²⁹. They should not be used beyond this distance as the steady state particle transport assumptions do not usually apply.

To make an accurate prediction of deposition and downwind drift, AGDISP requires a consistent set of inputs

- (representing the aircraft & its flight condition,
- the nozzles and the drop size distribution they create,
- the spray material properties and the
- ambient meteorology.

Default inputs³⁰

Obviously, when you have “real” figures, use them. Otherwise, here is some suggested default inputs

| | |
|------------------------------------|--|
| Aircraft description and operation | Helicopter [cxxx] Release height [3m] |
| Nozzle set up | Number [42] Boom span [70%] |
| Drop size distribution | Use what is on the label, otherwise use [ASAE fine to medium] for the worse case scenario |
| Meteorology | Wind speed @ 6.28 feet [5mph] Wind direction: [normal to flight path] Stability: [neutral] Temperature [28° C] Relative humidity [50%] |
| Test substance and application | Specific gravity [1.0] Application rate [0.25lb/ac] Swath width [60 ft] Nonvolatile fraction [0.03] Number of flight lines [20] |

If labeling or standard procedures don’t specify, modeling can be used in the planning stages of aerial pesticide operations.

Further reading;

- <http://apmru.usda.gov/downloads/downloads>
- <http://pep.wsu.edu/drift04> - proceedings of 2004 International Conference on Pesticide Application for Drift Management

²⁹ http://www.apvma.gov.au/use_safely/spray_drift/zones.php

³⁰ From Gatton notes, September 2011

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7.3 Specialist advice

When doing something “out of the ordinary”, practitioners should seek specialist knowledge and input. The Compliance & Improvement Manager, Softwood Plantations can help with contacts. Choice of treatment and specifications must be based on advice from appropriately qualified specialists.

7.4 Flying height and speed

In general terms, the higher the release height the greater the potential for drift. Refer to Section “*nozzle height*”, [Manual for the use of chemicals](#)

Procedures;

- Effective flying height³¹ should be a maximum of 3 metres above the canopy wherever possible.
Note: the pilot has the final say on flying height.
- Sprays should only be applied when the aircraft is straight and level above the crop.
- Helicopters should not be flown at very high velocities (i.e. no greater than 130 km/hr)³²

7.5 Marking of flightlines

Even and accurate application of agricultural chemicals is dependent on the aircraft maintaining accurate flightlines. GPS³³ document the path of the aircraft, delineate the treatment area, can be used to determine airspeed to ensure correct calibration and herbicide rates per hectare, and can be integrated with injection systems to control delivery rate³⁴.

Downloads of the GPS give a permanent record of the job, and provide the evidence that the work was carried out in the correct area, with no misses.

Procedure;

- All Forestry Corporation applications must be carried out using electronic line marking systems with satellite-guided differential GPS systems.
- Systems are to be compatible with Forestry Corporation’s GIS.
- Downloads should be conducted daily.
If there is a problem, Forestry Corporation should request a download of GPS information for immediate analysis
- Downloads should show all flight lines, including those outside the treatment area, and indicate where the application equipment was activated.

³¹ Height of the spray nozzles

³² Contract currently specifies 60 knots (111.12 km/hr)

³³ Global Positioning Systems

³⁴ <http://conference.ifas.ufl.edu/sehac/Onsite%20pdfs/Tuesday-pdf/am/0825%20Minogue.pdf>

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Supplementary systems, such as the use of balloons to mark the end of runs in dense forest may be used in some situations.

In no circumstances are people to be used as ground markers.

7.6 Smoke generators

Helicopters must be fitted with smoke generators. These are to be used to indicate wind direction for all pesticide applications near sensitive boundaries.

Procedure;

- Helicopters must be fitted with a smoke-generating device which should be used regularly during operations to monitor wind direction

7.7 2-way radio communication from controller to aircraft

Forestry Corporation controllers must have constant availability of 2-way radio communication with pilots during operations.

7.8 Complaints mechanism

Complaints should be investigated as per Appendix 4 "*Responding to a spray drift complaint*", [Manual for the use of chemicals](#)

7.9 Weather conditions

For a detailed discussion on weather, refer to "Section 10.3 Weather elements", [Manual for the use of chemicals](#). The main elements effecting operations are

- wind direction and speed
- atmospheric stability (and turbulence), and
- temperature and humidity

If weather conditions are not suitable to minimise the potential risks from drift, the spray operation must be delayed until conditions are suitable. The following limitations are recommended

7.9.1 Temperature, wind and delta t (ΔT)

Temperature affects the behaviour of liquid droplets. As temperature increases, water based formulations can evaporate, leading to the formation of smaller droplets. In this state, there is no control over chemical movement and damage to susceptible crop on off-target sites is possible.

- Rate of evaporation is greatest when droplets are small, temperature is high and humidity is low.
 ΔT (delta T) – the difference between dry and wet bulb temperatures – is used as an indicator of how dry the air is. The drier the atmosphere, the greater the amount of evaporative cooling and difference between the two bulb temperatures.
- High temperatures (> 30°C) can be an indicator or strong high atmospheric instability leading to a convective loss of spray to the atmosphere.

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Procedure;

1. Follow label/ off-label permit conditions at all times.
If there are no weather conditions listed on the label;
 - Winds must be steady in direction, away from sensitive areas, greater than 3-4km/hour, but must not exceed 12 km/ hour for herbicide applications.
 - Operations should cease in gusty or variable winds.
 - Spray with cross wind where adjacent to a sensitive area.
 - The maximum allowable temperature is 28°C.
 - ΔT^{35} (delta T) is not to be greater than 8° except when using **Accu-Flo** nozzles. Where Accu-Flo nozzles are being used, a ΔT of 14 is the maximum³⁶
2. Plans must specify allowable meteorological conditions for the operation

7.9.2 Inversion layer

An inversion layer is when air closer to the ground is cooling faster than the air above it, and forms a layer where air temperature increases with altitude instead of decreasing).

Small droplets released in an inversion layer can remain suspended for a long time & drift long distances. They are most likely in the early morning and late afternoon in the absence of wind, and are often marked by fog, or smoke drifting at a constant height rather than rising.

Procedure;

- Do **not** spray under conditions of atmospheric inversion

7.9.3 Topography

Topography influences wind direction and strength. Differences in elevation and air temperature can lead to mass movements of air independent of the prevailing weather pattern (anabatic and katabatic flows).

More significant to most aerial operations are the eddy currents produced by irregularities in land surface and vegetation boundaries which can move spray clouds in unexpected directions and over long distances.

Long distance drift may occur when sprays are released upwind of falling (concave) topography – the effect is to increase effective flying height and to reduce spray capture by the drop.

³⁵ Difference between dry and wet bulb temperature

³⁶ Refer advice from Dr Andrew Hewitt, University of Queensland (TRIM D00186241)

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7 Record of operations

The [Pesticides Act, 1999](#) details the requirements for records that must be kept for each aerial pesticide application, including;

- name, address and contact details of the pilot and of the owner of the land/areas (e.g. paddock) being treated
- registration number of the aircraft, and equipment used
- description of the pesticide that was applied
- where and when (date and time) the pesticide was applied
- method of application of the pesticide
- weather conditions during the application (before and during)
- description of the crop the pesticide was applied to
- description of the land over which the pesticide was applied (paddocks, blocks or other areas where you applied pesticides)
- quantity applied and the rate of application.

Procedure

- Records of all chemical application **must** be kept. Details must include dates, times, equipment settings and calibration, type and quantity of material used, personnel involved, any problems, results obtained, and weather and flightline records.

Monitoring and recording weather during the operation

3. Conditions (wind speed, wind direction, air temperature and relative humidity) must be monitored and recorded during pesticide operations, preferably with an on-site recording weather station.
Records must be stored with the Operational Plan

The Controller must have constant access to real time measurements of weather conditions.

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8 Technical and theoretical aspects of aerial spraying

8.1 Solids versus liquid application

[Manual for the use of chemicals](#) recommends granular formulations over liquid³⁷.

8.2 Aerodynamic effects of aircraft on spray patterns

Aircraft are an ideal platform to lay down a uniform even deposit of pesticide on a crop. However, it is possible for airflows associated with the aerodynamics of flight to interfere with the application process and increase the amount of drift.

8.2.1 Wing tip vortex generation in fixed-wing operations

Lift is generated by the wing of an aircraft because of a difference in pressure between the top and bottom surfaces of the aerofoil section as it moves through the air. At the wing tip, the higher pressure beneath the wing tends to migrate to the lower pressure area above it. This twisting of airflow produces a series of spiral eddies behind the wingtip, which combine to produce a single strong vortex behind each wing.



Sprays released behind the trailing edge of a wing will generally move downward towards the ground as a result of this vortex. However, small spray droplets can be easily caught up in the wingtip vortices, thrown up above the height of the aircraft and carried downwind of the intended target.

The strength of wing tip vortices increases

- As the lift generated by the wing increases, for example when an aircraft is letting into a field or pulling up sharply after a spray run
- As airspeed decreases
- As aircraft weight increases
- With the use of flaps.

³⁷ Chapter 3

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The effects of wing tip vortices are reduced by placing nozzles well inboard from the wing tips, at least 2.5 m for large turbine aircraft, and by increasing the droplet sizes generated from the nozzles positioned close to the wingtips.

To minimise entrainment of spray into vortices, spray systems should only be operated when the aircraft is flying straight and level across the target area. The spray must be turned off when letting into a field or when pulling up sharply at the end of a run.

l) **Figure 9.3.1; Trailing vortex behind a wing (after Spillman 1981)**

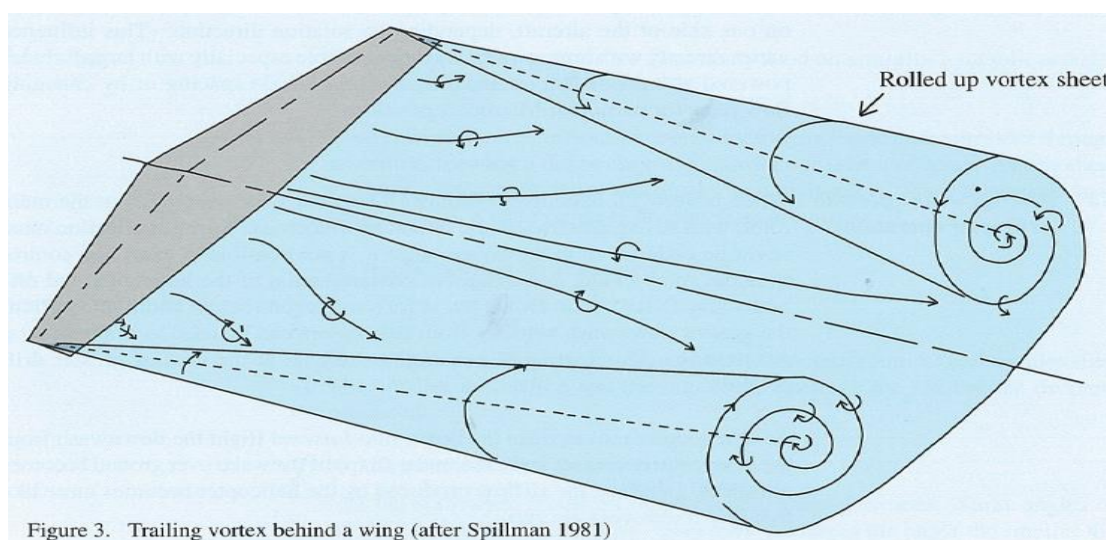


Figure 3. Trailing vortex behind a wing (after Spillman 1981)

8.2.2 Propeller effects

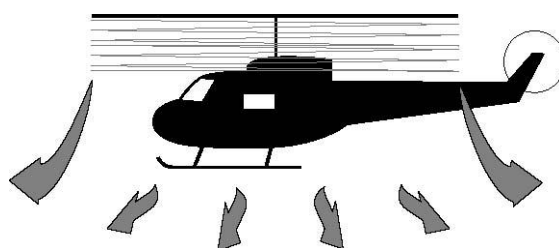
The axial velocity of air behind a propeller tends to concentrate smaller drops on one side of the aircraft, depending on rotation direction. This influence varies directly with horsepower, and is noticeable especially with large turbine-powered aircraft.

It is countered by varying nozzle spacing or by changing flow rates for particular Micronair positions.

8.2.3 Aircraft wake effects in helicopter operations

When hovering, a helicopter produces a toroidal flow pattern about the main rotor, with strong downward and lateral air velocities.

m) **Figure 9.3.3; rotor wake in hover near the ground. Strongest velocities are indicated by longest arrows** ³⁸



³⁸ courtesy of USA, Federal Aviation Administration, "Pilot and air traffic controller guide to Wake Turbulence"

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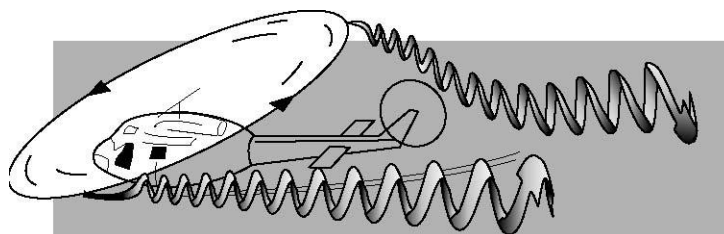
However, at forward speeds below about 40km/ hr the greater downwash velocity from helicopters can be used to improve crop penetration. This increased penetration may be at the cost of greater drift potential.

As a helicopter moves from the hover into forward flight, the downwash from the main rotor decreases and the annular shape of the wake over ground becomes elliptical. In effect, the airflow produced by the helicopter becomes more like that of a fixed-wing.

For the same reason that the aerofoil of a fixed-wing aircraft produces wing-tip vortices, tip vortices are formed by the main rotor of a helicopter. If droplets are allowed to become entrained into these vortices, then material can be moved vertically and laterally away from the target area, particularly at slower flying speeds when the vortices are stronger.

For this reason, spray booms are not to extend beyond the tip of the main rotor (recommend no more than 70%³⁹).

At high airspeeds it is possible for asymmetry to develop in the ground deposition pattern produced by helicopter. For a helicopter in forward flight, blades on one side of the aircraft are moving in the direction of flight whilst the blades on the other side are moving in the opposite direction. Because of the forward velocity of the helicopter, the relative velocity of air over the advancing and retreating blades is different. To avoid any rolling motion being transferred to the fuselage, blades are allowed to flap (i.e. change their relative angle of attack to the airstream). As a consequence of this blade motion, the vortex on the retreating side of the helicopter is stronger and smaller in diameter than on the advancing side. The overall result is the movement of air from the advancing to the retreating side of the helicopter. This asymmetry increases with airspeed.



n) Figure 8.2.3 In forward flight a pair of downward spiraling vortices are shed from the rotor blades. This region of rotating air below the helicopter is where wake turbulence occurs⁴⁰

8.2.4 Spray pressure

On aircraft in flight, the droplet size generated by some hydraulic nozzle systems is sometimes increased when hydraulic pressure is increased because the relative velocity between the spray liquid and local air velocity is effectively decreased. The pilot should consult the aircraft nozzle manufacturer's information.

³⁹ Latest research suggests 59% gives noticeable decrease in change of spray drift (CPAS, Gatton, September 2011)

⁴⁰ courtesy of USA, Federal Aviation Administration, "Pilot and air traffic controller guide to Wake Turbulence"

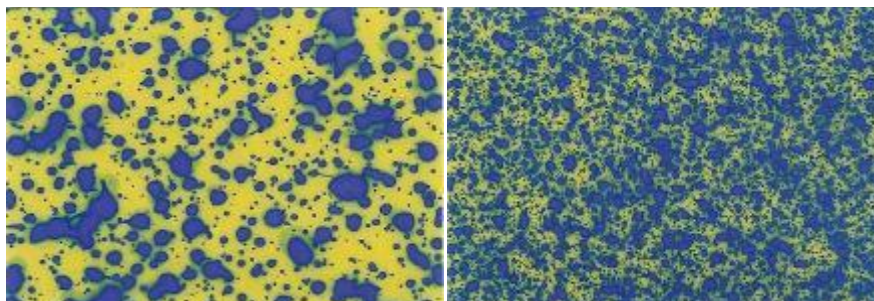
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8.3 Nozzles

The **label** may dictate droplet size (fine, medium, coarse, extra coarse).

Relative droplet size under varying conditions can be observed using water-sensitive cards. For example, the droplets produced by an air-induction nozzle are compared to those of a standard flat-fan nozzle (**Figure 2**).



o) **Figure 2 droplets produced from air induction nozzle(left) and droplets produced by a standard flat fan nozzle⁴¹.**

Where the label has not specified the appropriate size, it is necessary to choose a nozzle that delivers the required flow rate (refer Manual for the Use of Chemicals, Section 8.1)

8.3.1 Accu-flo nozzles

These nozzles have been designed for helicopter and fixed-wing aircraft, and are the preferred nozzle.



p) **Figure 3 Accu-flow nozzles⁴²**

The benefit of these nozzles is that they give a uniform droplet size, with few 'fines' if operated optimally.

8.3.2 Flat fan

An elliptical orifice converts a pressurized liquid into a tapered flat fan. A range of droplets are produced (5 to over 1000 μm). The relative proportion of the total spray volume in each size category depends on

- the orifice dimension,
- size (larger orifice = coarser spray),
- pressure (higher pressure = finer spray), and
- characteristics of the liquid being sprayed.

⁴¹ Credit: JA Ferrell, UF/IFAS Dept of Agronomy

⁴² http://msucares.com/crops/college/07presentations/pdf/thomson_spray-drift-mit.pdf

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Spray angles of 65°, 80° and 110° are common. Generally, the larger the angle, the smaller the droplets for a particular flow rate. Flat fans have a narrow drop size spectrum.

Advantages:

- reliability (i.e. little tendency to block)
- proven performance under many conditions
- allows the lowest pressures and water volumes due to its generally finer spray quality.
- Have a narrow drop size spectrum (see Section 4).

Disadvantages:

- can produce large amounts of spray drift, although larger orifices produce larger droplets (and therefore decrease drift).

8.3.3 Cone (hollow and solid)

Are produced by combinations of “D” disk with circular orifice (the D number specifies orifice diameter in sixty fourths of an inch) and an interchangeable core (swirl plate) which produces the cone of spray. The larger the cone number, the smaller the angle imparted to the spray, the larger the droplets and the higher the output. The disks can be used without the swirl plates when large droplet sprays are required (“solid stream” nozzles).

8.3.4 Micronair nozzles

The Micronair⁴³ nozzle is a rotary-centrifugal-energy nozzle. They are useful for applying low volumes of small droplet sprays (e.g. for fungicides or insecticides). These were a nozzle used commonly until about 1996, to CP and then Accu-flo nozzles.⁴⁴

These nozzles produce a similar droplet spectra as hydraulic nozzles, and they have the ability to modify the rotational speed of the units enabling adjustment of the droplet sizes. This is largely independent of the flow rate. This ability to ‘uncouple’ flow rate and droplet spectrum give these atomizers an advantage over hydraulic nozzles.

They can output larger volumes per unit, and so fewer are needed on an aircraft.

Volume output is controlled by a variable size orifice (“Variable Restrictor Unit” – VDU) in the sprayline. The cage is spun with a hydraulic motor, or by propeller blades operating in the slip stream. The speed can be altered by adjusting the angle of the blades. Droplet size is reduced by increasing the speed of rotation of the cage. The electric version of this nozzle provides the pilot with more control over the droplet size produced since the nozzle rotation is independent from aircraft forward speed

These nozzles are difficult to clog, since small orifices are not required to break up the liquid. Wettable powders and suspensions are more easily applied. However, higher

⁴³ manufactured by Micron www.micron.co.uk

⁴⁴ Forest & Wood Products Research & Development Corporation, “*The use of chemical pesticides by the Australian plantation forest industry*”, 2006
http://www.planningplantations.com.au/assets/pdfs/sustainability/environment/pesticides/FWP_RDCPesticidesFullreport.pdf

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application volumes (greater than 56 L/ha⁴⁵) usually are harder to obtain when using these nozzles⁴⁶.

8.3.5 Impact/ flood type nozzles

Includes brandnames Floodjet® and CP nozzles⁴⁷.

Produces a flat sheet of spray using an anvil or deflector tip. Droplet size is determined by the angle of the tip. These nozzles offer the versatility of multiple orifices so the pilot can quickly change flow rates, as well as a number of different angles of deflection.⁴⁸

- Offer flexibility with how much liquid flows through each nozzle, and whether Apps for estimating spray droplet size for aerial application

⁴⁵ Converted 5 gallons per acre

<http://www.omafra.gov.on.ca/english/busdev/facts/pub60a20.htm>

⁴⁶ Other manufacturers of similar nozzles are Davidon Inc. www.davidononline.com and Curtis Dyna-Fog Ltd. www.dynafog.com

⁴⁷ manufactured by the CP Products Company Inc www.cpproductsinc.com

⁴⁸ The USDA-ARS Area wide Pest Management Research Unit located in College Station, Texas, has developed several computer models users can access to learn more about setup effects of the CP nozzles in the production of small droplets. The models can be accessed at www.ars.usda.gov/spa/sparc/apmru

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|-----|-------------|---|
| 1 | 1997 | |
| 2 | August 2013 | |
| 2.1 | March 2015 | Update hyperlinks broken with the upgrade to TRIM2 |
| 2.2 | July 2015 | Update delta T information to be in line with Chemical Manual 9.4.3 |

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Pesticides record keeping form for aerial operations

Name, address and contact details of the owner of the land where the pesticide was applied:

Pilot details (name, address and contact details):

Registration number of aircraft:

| Date, start and finish times | Crop & weed/ pest targeted | Type of equipment used | Name of pesticide used | Amount of concentrated product used | Total quantity applied | Size of area sprayed | Order area was sprayed (refer map) | Estimated wind speed and direction | Weather details | Nozzle brand, type, & pressure settings |
|------------------------------|--|------------------------|------------------------------------|--|--|-------------------------------|---|---|--|---|
| | record spraying of road verges and any pesticides used in and around crops | | Record all the pesticides you used | If you mixed two pesticides together, you can record both on the same form | Total amount of water, oil or other things mixed with the concentrated product | Refer to your Operational Map | Write which compartment was sprayed first, second etc | record any significantly changes that occur during spraying | If they are specified on the label/ permit | |
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Pesticides record keeping form

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Information on filling out the Pesticides record keeping form

- The **full name** of the product (e.g. “Velmac G Granular Herbicide”, not just “Velmac”)
- The **crop** treated/ or the situation in which the pesticide was applied (e.g. the road easement along Craig’s Road between the intersections of Smith and Jones Logging Road)
- The **rate** of application (this is on the label or permit) and the **quantity** of pesticide applied (e.g. Record the total amount of pesticide concentrate you used in a mix, the total amount of mix you made up, how much you used and the area covered by the application.
- A description of the **equipment** used. Also record the brand and type of nozzle, plus settings (spray pressure, blade angle or unit rpm where appropriate). This is now an APVMA requirement.
- The property **address** and a clear delineation of the area where the pesticide was applied, including the order in which compartments were treated. You may wish to use a map
- The **date** and **time** of application, including the times you started and finished the job
- The name, address and contact details of the person who applied the pesticide. If you employed someone to apply the pesticide then that person must record their name as well as the employers.
- The name, address and contact details of the owner or person who has management control of the land where the pesticide was applied
- Meteorological conditions, such as wind speed and direction, temperature and humidity

The record must be

- made within 24 hours of application,
- in legible English.

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Tracking Herbicide Form

| Date | Controller name | Product | Product (circle) | Amount on the trailer on arrival in AM (kg/L) from day before | Amount added | Store (circle) | Block name | Amount at end of the day (kg/L) will be same as next day's "amount on trailer AM" column | Total used on block (kg/L) | Comments |
|------------------|-----------------|------------|--------------------|---|--------------|----------------|------------|---|----------------------------|----------|
| e.g. 11/10/12 | D. Molquentin | Atrazine/ | Farmozine | | 1080 | Bondo | Micalong | 780 | 300 | |
| | | Hexazinone | Grunt Velpar DF | | 446 | Ardrossan | | 342 | 100 | |
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| Document title: Manual for the use of chemicals | Version No.:8 | Page: 75 of 75 |
| Document ID: Planted Forests D00071265 and Native Forests D00088959 | Issue date: January 2013 | Review date: January 2017 |

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