Environmental and Social Risk Assessment (ESRA) for Glyphosate

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FSC's 2019 Pesticide Policy – A Change in Approach

The FSC in August 2019 introduced a new pesticide policy. It incorporates a risk-based approach that considers not only the hazard of the active ingredient but also how the chemical pesticide is used. The new method requires companies to complete an Environmental and Social Risk Assessment (ESRA) rather than apply for a derogation. This is explained fully in the pesticide policy and the annexe.

Risk-based assessment is a significant shift from the previous pesticide policy that followed a hazard approach which identified chemical pesticides with high toxicity and prohibited their use unless the FSC Board of Directors granted a temporary derogation for their use. Derogations were for up to 5 years, and the FSC determined the conditions of their use.

If our company wants to use an HHP pesticide and it does not have an existing derogation, or the derogation is no longer valid, then we need to do an Environmental and Social Risk assessment (ESRA).

What is an ESRA?

FSC describes an ESRA as 'a process to predict, assess and review the likely or actual environmental and social effects of a well-defined action, evaluate alternatives, and design appropriate mitigation, management and monitoring measures. In the context of the FSC Pesticide Policy, it relates to chemical pesticide use.'

An ESRA contains these main steps:

- Identify the lowest risk option to control a pest, weed or disease, the conditions for its use and the generic mitigation and monitoring measures to minimise the risks
- Consider the approved list of hazards, exposure elements and exposure variables

- Select the option that demonstrates the least social and environmental damages, more effectiveness and equal or greater social and environmental benefits
- Before applying any chemical pesticide, incorporate the results of the ESRA to site operational plans, to identify site-specific risks
- Use of HHP according to approved methods
- Make the ESRAs and incorporation to the operational plans available to affected stakeholders upon request.

An ESRA has significant advantages over a derogation because the outcome of the process is determined locally and not at FSC in Germany, and once completed and approved by the auditors and the FSC National Standards Development Group it doesn't have an expiry date. However, our effort still needs to be directed at finding non-chemical methods or those that are better for the environment.

FSC's transition from Derogations to Environmental and Social Risk Assessments (ESRAs)

Many commonly used forestry pesticides currently have derogations. The new policy means that no new derogations applications will be processed. Existing approved derogations and their conditions will remain valid until their expiry date or until national HHP indicators become effective and replace the derogations.

This means that if companies need to use an FSC restricted HHP that there isn't a valid derogation for its use, companies will need to meet the new policy and conduct an environmental and social risk assessment (ESRA).

Glyphosate is Now One of FSC's Highly Hazardous Pesticides

FSC has revised the list of Highly Hazardous Pesticides (HHP). Glyphosate wasn't previously on the list, but now it is. FSC classified it as a probable carcinogen. Although not all experts agree with this rating, it is wise to be cautious about any chemical used, and besides FSC requires us to follow their rules.

ESRA Part A: Hazards and Exposure Elements Table

The first step is to understand how glyphosate creates hazards to the environment or to our lives. These are called exposure elements. The following table helps determine the type and level of risk so we use the correct mitigation measures.

Table 1: Identification and Assessment of Risk With Mitigation Strategies

Exposure elements	List of values	Hazard groups and types of hazards[1,2]									Descriptor of why / why not a risk3	Mitigation strategies dzefined to minimise risk[4]
		Acute toxicity		Chronic toxicity				Environmental toxicity				
		Toxic by contact or ingestion	Toxic by inhalation	Carcinogenicity	Mutagenicity to mammals	Developmental and reproductive toxicity	Endocrine disruptor	Acute toxicity to aquatic organisms	Persistence in soil and water	Biomagnification - bioaccumulation		
Environmental	Soil erosion and degradation	Na	Na	Na	Na	Na	Na	Low	Low	Na	Weight of evidence indicates there is a low risk of glyphosate affecting erosion if used according to the label and good practice standards. An area of risk is where road cuts and fills are sprayed and re-vegetation measures established at construction are killed off, especially those on recently constructed roads and landings in the erosion-prone hill country. Until glyphosate salts break down, rain-triggered erosion could elevate levels of glyphosate bound sediment if it got into water bodies.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Pay attention to the timing of the operation. Evaluate both short term weather to ensure the pesticide is absorbed in the vegetation and not washed off by rain or dew and that the longer-term forecast does not identify events that could lead to erosion and sediment from the application site. Generic mitigation strategies are within the mitigation section of the ESRA.
	Soil carbon storage	Na	Na	Na	Na	Na	Na	Na	Na	Na	There are no foreseen risks associated with soil carbon. Studies have generally reported minimal impacts on litter decomposition, soil microbial communities and soil microbial processes, factors that could impact soil carbon, from glyphosate applied under typical application rates in forests.	Weight of evidence indicates that there are no foreseen risks, so no mitigation strategies are anticipated.
	Soil biota	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	There is a low risk of glyphosate affecting soil biota. Studies have generally reported minimal impacts from glyphosate applied under typical application rates in forests, on litter decomposition, soil microbial communities and soil microbial processes. However, it is solely noted on the Australia/NZ SDS that 'Microbial degradation is the major cause of loss from soil with the liberation of carbon dioxide.' This may be the case in agricultural soils where the product is used seasonally and not once or twice in a rotation.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Focus on practice standards that help keep application rates at, or below, manufacturers label rates like timing for optimum pesticide effectiveness. Generic mitigation strategies are within the mitigation section of the ESRA.
	Water (groundwater, surface water, water supplies)	Na	Na	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	Weight of evidence indicates there is a low risk of glyphosate affecting water if used according to the label and good practice standards. The breakdown of glyphosate in forest floor litter and soils is generally rapid (litter: DT50 8 to 19 days; soil: DT50 5 to 40 days) and glyphosate is rarely detected below the upper 15 cm level of soils indicating that it is very unlikely to percolate down through forest soils and into groundwater. However, glyphosate can potentially enter freshwater either from direct spray or spray-drift or accidental spillage if storage or load zone is poorly located.	Many practice standards are involved around precision spraying around water. Some are listed below. Refer to the generic mitigation strategies within the mitigation section of the ESRA for additional ones. For example, ensure the pesticide gets applied solely to the application area and that run-off or sedimentation from rain is eliminated. Also, use operators with proven track records and methods that help keep application rates at, or below, manufacturers label. Also refer to the health and welfare, social and infrastructure sections below for additional mitigation.
	Atmosphere (air quality, greenhouse gases	Na	Na	Na	Na	Na	Na	Na	Na	Na	Glyphosate has no foreseen risks to the atmosphere. Aerial spraying will result in application area having pesticide in the air until the spray settles.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Focus on application methodology if using aerial spraying particularly around ensuring people and livestock are not within the application area during spraying. Refer to the generic mitigation strategies within the mitigation section for additional ones. Also, refer to the health and welfare section below

	List of values	Hazard groups and types of hazards[1,2]									Descriptor of why / why not a risk3	Mitigation strategies defined to minimise risk[4]
		Acute toxicity		Chronic toxicity				Environmental toxicity				
		Toxic by contact or ingestion	Toxic by inhalation	Carcinogenicity	Mutagenicity to mammals	Developmental and reproductive toxicity	Endocrine disruptor	Acute toxicity to aquatic organisms	Persistence in soil and water	Biomagnification - bioaccumulation		
	Non-target vegetation	High	Na	Na	Na	Unlikely	Na	Na	Na	Unlikely	Glyphosate is a non-target herbicide. Spray contact with non-target vegetation could be severely affected. This will depend on the amount of drift and the sensitivity of the species to glyphosate.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Non-target application of glyphosate is one of the largest potential risks when working next to neighbouring properties. Be particularly vigilant when aerially spraying especially around communication and timing of application. It is preferred practice to offset boundary spraying with a ground application if aerial spraying is intended for the block.
	Non-target terrestrial wildlife, bees and the other pollinators, pets	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Na	Low	Unlikely	There is little information available on forest terrestrial fauna. However, they are potentially at risk through a direct spray, spray drift or wash-off following rainfall events, and uptake via inhalation and absorption. Amphibians are particularly vulnerable. Secondary exposure is also possible through the ingestion of flora and fauna food sources containing glyphosate residues. However, the indicators for toxicity are listed as 'non-toxic': honeybees (arthropods), duck and quail (birds), earthworms (soil organisms). Where there are hives in the forests, care will need to be taken especially in roadside spraying operations where clover or other flowering plants have been used in the oversowing blend.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Focus on practice standards that help keep application rates at, or below, manufacturers label rates like timing for optimum pesticide effectiveness.
	Non-target aquatic wildlife	Low	Na	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	Glyphosate is toxic to aquatic life with long-lasting effects. However, forest field studies indicate that the concentrations and duration of glyphosate typically measured, except for direct over-spraying of wetlands, were well below the standard toxicity endpoints for fish and other aquatic organisms. Some studies indicate that the surfactant added to glyphosate to improve efficacy could have significant impact to aquatic wildlife like frogs and tadpoles. Avoid or be highly selective of the surfactant.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. The risk of glyphosate over-sprayed on waterways will significantly where there are incised gullies with low-order streams that are difficult to detect or avoid during aerial spray applications. Mitigation strategies include ensuring that the map and GPS coverage identifies all waterways and use droplet size that reduces drift.
	Non-timber forest products (as FSC-STD-01-001 V5-2 FSC principles and criteria, criterion 5.1)	Low	Na	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	Low risk as glyphosate is used regularly and extensively in food production. For specifics, if the non-timber product is a plant crop, refer to the risks within the non-target vegetation. If the non-timber product is aquatic, refer to the risks within non-target aquatic mitigation. If the non-timber product is terrestrial, refer to the non-target terrestrial risk section above.	If the non-timber product is a plant crop, refer to the requirements within the non-target vegetation. If the non-timber product is aquatic, refer to the non-target aquatic mitigation. If the non-timber product is terrestrial, refer to the non-target terrestrial section above.

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	Landscape (aesthetics, cumulative impacts)	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	The risk to landscape is low. However, the risk increases with scale and intensity. For example, large aerial sprayed areas could increase the hazard, especially if bordering neighbouring properties that could include state or national forest or parks.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Non-target application of glyphosate is one of the largest potential risks when working next to neighbouring properties. Be particularly vigilant when aerially spraying especially around communication and timing of application. It is preferred practice to offset boundary spraying with a ground application if aerial spraying is intended for the block.
	Ecosystem services (water, soil, carbon sequestration, tourism)	Na	Na	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	The risk is low; however, specific circumstances could increase risk. Refer to the individual risk sections for water, soil, carbon sequestration, and tourism.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Refer to the individual mitigation sections for water, soil, carbon sequestration, and tourism.

Exposure elements	List of values	Hazard groups and types of hazards[1,2]									Descriptor of why / why not a risk[3]	Mitigation strategies defined to minimise risk[4]
		Acute toxicity		Chronic toxicity				Environmental toxicity				
		Toxic by contact or ingestion	Toxic by inhalation	Carcinogenicity	Mutagenicity to mammals	Developmental and reproductive toxicity	Endocrine disruptor	Acute toxicity to aquatic organisms	Persistence in soil and water	Biomagnification - bioaccumulation		
Social	High conservation values (especially HCV 5-6)	Na	Na	Na	Na	Na	Na	Na	Na	Na	The risk is likely to be Not Applicable mitigation in an Australian/NZ context unless in a specific individual company situation. These will need to be addressed in the application-specific ESRA.	There is no need for mitigation in an Australian/NZ context unless in a specific individual company situation. These will need to be addressed in the application-specific ESRA.
	Health (fertility, reproductive health, respiratory health, dermatologic, neurological and gastrointestinal problems, cancer and hormone imbalance)	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	FSC categorises glyphosate as highly hazardous due to its potential as a carcinogen. However, the weight of evidence indicates that there are unlikely to be any health-related hazards if used according to the label and good practice standards. Most studies report that there is no, or unlikely carcinogenic or genotoxic risk to humans at anticipated exposures. Views aren't consistent, for example, those of PAN.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Meeting high personal care, material handling and pesticide application standards and health check requirements are essential. Generic mitigation strategies are within the mitigation section of the ESRA. These include health-specific mitigations like ensuring the contractor has read and fully understood how to apply glyphosate and the Personal Protective Equipment (PPE) requirements for it, the health and safety and environmental emergency procedures are well understood, and all PPE is on-site, in good condition, and correctly used*
	Welfare	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	Welfare has been assessed the same as health since health (and happiness) are key components of welfare. Weight of evidence indicates that there is unlikely to be any health-related hazards if used according to the label and good practice standards. Most studies report that there is no, or unlikely carcinogenic or genotoxic risk to humans at anticipated exposures. Views aren't consistent, for example, those of PAN.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Meeting high personal care, material handling and pesticide application standards and health check requirements are essential.
	Food and water	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	Weight of evidence indicates there is a low risk of glyphosate affecting food and water if used according to the label and good practice standards. An area of risk is through accidental or ongoing oral ingestion by pesticide workers on-the-job poor personal hygiene around food and drink. Also, poor application timing before heavy rain or direct spray over water may increase the likelihood of broader risk to water. Forest products have a much lower risk profile compared with normal food crops. Glyphosate in Aust/NZ has not been recorded in drinking water and food other than at factors of levels below what is considered unsafe.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA. Meeting high personal care, material handling and pesticide application standards and health check requirements are essential. Generic mitigation strategies are within the mitigation section of the ESRA.
	Social infrastructure (schools and hospitals, recreational infrastructure, infrastructure adjacent to the management unit)	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	Poor practice can lead to significant risks like spray drift killing crops and contaminating water contamination. Recreation could be impacted, see rights section below.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA which includes managing operations around adjacent properties and communication with potentially affected parties will mitigate risks. Take particular care and initiate additional operational conditions, if necessary, around water reservoirs, neighbours water intakes within the forest boundary, or around public forest recreational activities e.g. mountain bike tracks, or other potentially riskier sites.

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	Economic viability – other primary sector	Low - High	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	There is always a potentially significant risk when aerial spraying next to boundaries. Glyphosate overspray could have an economic impact to adjoining horticulture leading to costly compensation or legal action. Glyphosate is a non-target pesticide so sensitive crops can easily be killed or browned off. Organics are especially vulnerable.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA which includes managing operations around adjacent properties including communication with potentially affected parties will mitigate risks. It is essential to discuss the operation thoroughly in-house between the different management teams that may be involved. It is also critical to discuss the pesticide application with neighbours. It is preferred practice to offset boundary spraying with a ground application if aerial spraying is intended for the block.
	Economic viability - tourism	Low	Low	Unlikely	Unlikely	Unlikely	Unlikely	Low	Low	Unlikely	The risk to tourism can be both internal and external. Internal tourism would include in-forest mountain bike riding, horse trekking, and hunting. External would include adjoining state or national forest land or national parks. Glyphosate is a non-target pesticide so will kill or brown-off all species that are sensitive to it.	Meet the requirements of the generic mitigation and monitoring measures section of the ESRA which includes managing operations around adjacent properties including communication with potentially affected parties will mitigate risks. It is essential to discuss the operation thoroughly in-house between the different management teams that may be involved. It is also critical to discuss the pesticide application with neighbours. It is preferred practice to offset boundary spraying with a ground application if aerial spraying is intended for the block.
	Other											

1 = Weight of evidence base. 'Unlikely' means there is not a unanimous agreement between assessment organisations but a general agreement. For example, almost all international government agencies disagree with the WHO's IARC 2015 categorisation of glyphosate as a "probable carcinogen". Evidence based means that "Unlikely" has been entered in the carcinogenicity column even though the FSC has categorised glyphosate as highly hazardous due to carcinogenicity.

2 = The risk associated with the hazard is based off using glyphosate under the label and regulatory requirements.

3= The appendices provide additional information.

4 = Refer to 4.12 (2) section of this ESRA for general mitigation requirements

ESRA Part B: Scale, Intensity and Risk

Scale	A measure of the extent to which a management activity or event affects an environmental value or a management unit, in time or space. An activity with a small or low spatial scale affects only a small proportion of the forest each year, an activity with a small or low temporal scale occurs only at long intervals (Source: FSC 2011).
Intensity	A measure of the force, severity or strength of a management activity or other occurrence affecting the nature of the activity's impacts (Source: FSC 2011).
Risk	The probability of an unacceptable negative impact arising from any activity in the Management Unit combined with its seriousness in terms of consequences (Source: FSC 2011).

Source: FSC-STD- 01-001 V5-2 EN

Scale, Intensity and Risk (SIR) is mention extensively within FSC's Principles and Criteria, and it is also an essential component of an ESRA.

Glyphosate is used for many forestry operations across a wide range of scales, with different intensities and risk profiles. The risk profile will change depending on how we apply it, the size of the treatment area and the risks within, and external, to the site.

- Scale: Our operations range from small ones comprising of a fraction of a hectare like road edge spraying to large ones covering hundreds of hectares as with after clearfell land preparation.
- Intensity: Glyphosate is applied by hand with a backpack spray unit, by small vehicles with a tank, reel and handheld spray nozzle, vehicles with spray booms, or broadscale helicopter application
- Risk: Spot spraying over small areas has limited risk; however, risk across all exposure variables will likely increase significantly for large scale aerial applications in the steep hill country with rapidly changeable weather.

We can apply glyphosate in the following operations:

- Pre-plant and post-plant (with shield) spot spray
- Pre-plant desiccation (aerial and or ground-based machine)
- Weed control around infrastructures like buildings, roadsides, Fire dams and other sites
- Wilding or pest tree control (drill/cut-stump and paste)
- General noxious weed control (by hand or ground vehicle)

We need to apply the following generic mitigation requirements across all scale, intensity and risk. The following section details this mitigation. Some conditions are solely for aerial applications and generally are identified as such, but most are across all SIR.

The level of detail to assess a small spot spray job or a roadside weed spray will be minor compared to a broadcast extensive aerial treatment. Some of the generic mitigation or monitoring requirements are not necessary for some jobs. Rather than have a series of mitigation requirements by operational type, intensity and risk profile, it is simpler to go through a standard generic checklist.

ESRA Part C: Generic Mitigation and Monitoring Measures to Minimize the Risks

Pre-operational Planning

Develop an operational plan*

- Decide on the scale of treatment area*
- Complete both an office and field-based planning process to assess site hazard and risks, and provide ground-truthing
- Assess the sensitivity of the off-target vegetation
- Determine the application method*
- The field map must show spray/no spray areas and include information on potentially at-risk adjoining property, or environmental features Identify no-fly zones
- Create the plan to ensure the glyphosate stays within the target area and not contaminate other land, water supplies, streams or water bodies
- Determine minimum buffers by application method and buffer type
- Buffer zones will be left to protect water quality, non-target plants and non-target land. Buffer widths will be commensurate with the potential risk and consequences.

Meet legal requirements

- Comply with regulatory requirements, both state and national, and meet FSC requirements for chemical use.

Select formula and rates*

- Use non-pesticide methods of weed control in preference to glyphosate where effective, practical and financially prudent, as consistent with the company pesticide use policy (a requirement of the ESRA).
- Aim for pesticide applications to coincide with optimal plant uptake
- Follow approved product label instructions
- Use application rates below the manufacturers label rates, where still effective and legally possible
- Target pesticide only on required areas
- Consider soil properties and erosion in the treatment area
- Decide on the type and rate of application method, including the:
    - Formulation (type and components)*
    - Concentration of the active ingredient(s)*
    - Dose of the active ingredient(s)*
    - Mixture of active ingredients (composition and mixing process)*
    - Metabolites of the active ingredient*
    - Frequency and interval of application*
    - Note if there have been other pesticide applications*

- Consult the online FSC database for information exchange on alternatives and monitoring procedures*
- The results of the ESRA must be incorporated into planning and development of the prescription and operational maps*

Training, competencies, and job responsibilities requirements*

- Staff involved with planning, managing and undertaking the operation need to be trained and have the appropriate certificates or approvals
- Staff must understand the ESRA of the job
- Use only experienced contractors with suitable qualifications, current licenses, and demonstrated competency
- Individual staff, contractors and their employees understand their responsibilities in the operation.

Undertake pre-operation consultation with neighbours and community (if treatment area adjoins property boundary or operation could impact)

- Engage with stakeholders in conformance with the requirements in the applicable National Forest Stewardship Standard or Interim National Standard when conducting ESRA*
- Make the ESRAs and incorporation to the operational plans available to affected stakeholders upon request*
- Send written notification to neighbours adjacent to the operation and potentially affected stakeholders before any operation starts
- Inform the affected community if non-timber products like blackberries have been sprayed in publicly accessible forest areas
- Consider a no aerial spray buffer when a residential structure/yard, water intake or water well is immediately adjacent to the treatment area. Instead, treat with ground application methods.

During Operations

Operational briefing and sign-off plan

- Complete a pre-operational briefing and induction to confirm the operational area and operational requirements
- Ensure the site operational plan and map (prescription) is agreed and understood by all and signed off by the contractor and the company.

Health and safety and hazard identification*

- Work cannot start until the contractor has signed-off the prescription
- Ensure contractors have read and fully understood how to apply glyphosate and the PPE requirements for it
- Involve the contractor with site hazard identification and mitigation
- Ensure the health and safety and environmental emergency procedures are well understood
- Ensure all Personal Protective Equipment (PPE) is on-site, in good condition, and correctly used*
- Follow the product label and SDS
- Current SDS must be on-site, accompanying pesticides transported, and also kept at chemical storage locations
- Decide on signage needed and install for the operation

- Shut down the operation immediately if it breaches the requirement of the prescription
- Have handwashing facilities and separate drinking water available on-site
- Ensure a first aid kit is available at transport, storage and application sites
- Explain first aid measures the glyphosate SDS requires (from Aust/NZ SDS):
    - Inhalation: If inhaled, move the person to fresh air. Keep at rest in a position comfortable for breathing until recovered. Get medical advice if symptoms persist. If the person is not breathing, seek immediate medical assistance and give artificial respiration.
    - Ingestion: Do not induce vomiting. Rinse mouth with water. Get immediate medical advice.
    - Skin: Wash affected area with plenty of soap and water. If irritation persists or develops, get medical advice.
    - Eye contact: Hold eyelids apart and flush continuously with water several minutes. Remove contact lenses if present, continue rinsing for more than 5 minutes. If irritation persists or symptoms develop, seek immediate medical attention
    - The health of workers exposed to glyphosate will be monitored.

Clear operational areas of non-authorised people

- Ensure that the operational area is clear of non-authorised people, especially in aerial operations. This could include:
    - Installing signs or notices at suitable locations on roads and tracks leading to the target areas to warn the public of aerial operations
    - Creating road blocks
    - Carry out a reconnaissance flight over the target areas if aerial treating.

Transport and storage

- Park or store chemicals safely away from ditches, water bodies and riparian zones to avoid contamination of waterbodies
- Secure and safely transport pesticide to the operational area
- Transport, handle and store chemicals according to label instructions, SDS and other regulatory requirements
- Store pesticides in a chemical shed or secure, weatherproof location that meets regulatory requirements
- Don’t leave pesticides unattended on-site unless locked, secured and in a safe area.

Mixing and loading sites

- Mix to specification
- Measure accurately and without spillage
- Use clean water free of contaminants. Contaminants like dirt or rust will affect calibration by reducing nozzle flow or droplet size
- Select mixing sites where spills can be contained, and will not directly enter a ditch, waterbody, riparian zone or reserves
- Don’t load or mix herbicide at tank refilling locations
- Ensure when filling a tank that back-syphoning from the tank cannot occur
- Dispose of wastewater from cleaning storage tanks, equipment and containers safely away from ditches, water bodies and riparian zones.

- Never dump a load or a tank mix
- Containers must be disposed of appropriately off-site. The preferred method is to recycle via the chemical suppliers, drum-muster or agri-recovery sites.
- Ensure materials are on site to clean up or contain a spill.

Calibration of equipment

- Calibrate application equipment before starting work and during operations to ensure uniform and accurate distribution over the area
- Check regularly that usage matches hectares treated.

Weather and climatic conditions*

- Do not begin treatment unless conditions are within operational parameters
- Suspend all, or part of the program, if weather conditions or other factors are not optimal
- Undertake regular monitoring of weather conditions. These must meet application parameters or else the operation needs to be immediately shut down
- Continue treatment only if weather conditions are within the application parameters for maximum wind speed, wind direction, no rainfall, no inversion layer (surface or other), no cold air drainage, soil moisture, air temperature and relative humidity
- If aerial spraying, include additional specific application requirements - monitoring airspeed, release height and flight direction.

Apply Pesticide only to the treatment area*

- Treat all areas identified for treatment within the operational boundary
- Ensure an even distribution over the treatment area or as specified
- Ensure complete coverage of the treated area. Consider using effective marking systems (e.g. dye or foam) or electronic guidance systems
- Additional aerial spraying specific application requirements include:
    - Carry out the aerial application only by helicopter
    - Use only helicopters equipped with an on-board computer to monitor the chemical flow rate and give precise in-flight management of the application system.
    - Use only application system must have precise cut-off and no-drip nozzles.

Prevent leaching and spray drift *

- Ensure conditions are optimal for the job to start and within specification limits
- Ensure there is no risk of off-site damage by leaching or spray drift outside of the target area
    - Don’t treat restricted areas or buffers
    - Don’t contaminate any water supply, permanent or temporary stream, wetlands or other water bodies.
- Stop treatment or increase buffers where there is a downwind spray drift risk
- Use appropriate nozzles and pressures to reduce the risk of off-site impacts.
- Pesticide must not contaminate water supplies, or water bodies like streams, lakes or dams.

Social responsibility and care during operations (neighbours and community)*

- Notify neighbours adjacent to the operation, or potentially affected parties that need to be contacted on the day of operation
- Locate mixing sites and helipads away from neighbouring properties
- Don't fly loaded helicopters over adjacent ownership
- No aerial application if target areas are near a school, public playground, council/state/national park, or municipal water reservoir. Prudently use ground applications along the adjoining boundary.
- No glyphosate application within a Streamside Management Zone or a Riparian Management Zone unless to control exotic-invasive species and only if the treatment doesn't impact erosion or water quality.

Contain spills*

- Have an emergency spill kit or spill containment system available suitable for the quantity and type of chemical being stored and used
- Dispose of contaminated material responsibly and legally (location determined by spill size) well away from any ditch, waterbody, riparian or reserve.

Keep operational records*

- Keep the following records that FSC requires for the ESRA:
  - Product trade name*
  - The application rate of the product*
  - Date & time product was used*
  - Name and address of the applicator/supervisor*
  - Crop or situation that was treated*
  - Location where the product was used*
  - Area of land treated*
  - Weather details (previously listed)*.

Post Operational Monitoring

- Assess coverage of the operation, e.g. through visual checking for dye or through comparing electronic tracking performance against operational boundaries
- Check coverage to identify any areas of overspray or spraying outside boundaries
- Measure indicators of success including spray efficacy and no off-target adverse effects
- Undertake water sampling and analysis for chemical residues on high-risk sites to monitor the effectiveness of buffers & other protection measures
- Establish and monitor pesticide applicators health.

Improving Operational Effectiveness

- Have programmes in place, according to SIR, to research, identify and test alternatives to replace FSC highly restricted HHPs and restricted HHPs with less hazardous alternatives*
- Programmes shall have clear actions, timelines, targets and resources allocated*
- Programmes will usually be collaborative with other companies or research organisations.