Adoption of key management practices for the success of dry and early sown lentil crops

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Key messages

- Herbicide strategies combining multiple modes of action and/or application timings (IBS + EPE) provided the most effective capeweed suppression, particularly under dry sowing conditions.
- Diuron 830 IBS + Broadstrike 25 EPE provided the greatest capeweed control of up to 86% on the sandy rise.
- Weed competition influenced lentil yield in the herbicide trial on the loamy flat, with IBS + EPE strategies producing the highest yields.
- Terrain Flow 125 mL/ha IBS reduced lentil establishment on the loamy flat, highlighting the importance of matching herbicide selection to soil conditions, as per product label.
- PBA Highland XT was the highest yielding variety on the loamy flat in 2025.

Background

Dry and early sowing is a widely adopted practice across the southern Australian cropping region in response to increasingly variable and delayed opening season rainfall. Although substantial research supports these approaches, there remains a need to translate findings to locally relevant strategies that align with grower priorities, management preferences, and regional soil and environmental conditions. Regionally focused experimentation is therefore critical for generating evidence that supports confidence to adopt best practice herbicide management strategies and variety selection for dry and early sowing systems.

Lentil production in the Murray Plains has expanded substantially over the past two to three years. However, there has been limited local evaluation of the crop's agronomic fit across the region's diverse soil types and landscape positions. Consequently, growers have had limited region-specific data to make sound decisions around crop suitability, herbicide strategies, and broader agronomic management under local conditions.

This work forms part of the Derisking the Seeding Initiative, which aims to improve grower confidence by identifying both opportunities and risks associated with lentil production across contrasting soil environments. The project focuses on areas not traditionally prioritised for lentils since their introduction to the region, with the objective of reducing production risk and improving profitability outcomes. Fully replicated field trials were established to generate robust, regionally relevant evidence addressing herbicide management strategies and variety selection for dry and early sown lentil crops in the Murray Plains.

Methods

Two independent experiments, a lentil variety trial, and herbicide evaluation trial, were established across two contrasting soil types near Tepko (-34.949452°, 139.198531°), South Australia, in 2025. The trials were sown on 14 May using a randomised complete block design (RCBD) across two landscape positions, a sandy rise and a loamy flat, to capture landscape-driven variability typical of the Murray Plains region. Herbicide treatments were randomly allocated within each block, with each treatment represented once per block.

Sowing depth of lentil was 4-5 cm with a target plant density of 120 plants/m^2. Plots were sown using an experimental plot seeder fitted with Atom Jet side-banding points and were otherwise managed according to district best practice, aside from the imposed treatments. All agronomic inputs, other than herbicide treatment, were applied uniformly across plots.

The variety experiment included commercially available cultivars selected to represent a range of flowering and maturity timings (Table 1).

The herbicide experiment comprised multiple treatments applied at defined label rates and timings, including incorporated by sowing (IBS), pre-sowing/pre-emergent (PSPE), and early post-emergent (EPE) strategies (Table 2). Herbicide was applied using a shrouded multi-boom plot sprayer on 14 May for IBS and PSPE treatments, and on 15 July for EPE treatments. Along with the IBS and PSPE treatments applied on 14 May, a broadcast application of Trifluralin 480 (1 L/ha) and Rustler 500 SC (propyzamide at 1 L/ha) was applied across the herbicide trials prior to sowing. All capeweed density counts were conducted on 14 August, while lentil establishment counts were conducted on 4 September. The loamy flat site was harvested on 18 November.

Data were analysed using one-way analysis of variance (ANOVA) in GenStat (VSN International). Treatment means were compared using Fisher's protected least significant difference (LSD) test at the 5% significance level.

Table 1. Agronomic characteristics of lentil varieties grown at Tepko, 2025. All varieties possess a grey seed coat colour and red cotyledon colour. (2026 Crop Sowing Guide)

Variety	Market category	Vigour	Plant height	Flowering time	Maturity time	Lodging resistance	Pod drop	Shattering
PBA Highland XT	SRP	Mod/good	Medium	Early	Early/mid	MR	MR	MR
ALB Terrier	SRP	Moderate	Medium	Mid	Mid	MRMS	MR	MR
GIA Lightning	SRP	Moderate	Medium	Mid	Mid	MR	MR	RMR
GIA Thunder	SRP	Moderate	Medium	Mid	Mid	MRMS	MR	RMR
GIA Leader	MRS	Moderate	Medium	Mid/Late	Mid/Late	MR	MR	MR
GIA Metro	LRS	Mod/poor	Short/med	Late	Mid/late	MR	MR	RMR

Market category: MRS = medium red split, SRP = small red premium round (football), LRS = large red split.

Table 2. Application label rates (commercial product) and timings of herbicide treatments applied on GIA Thunder lentils at Tepko, 2025.

Treatment	Rate 1 (g or mL/ha)	Rate 2 (g or mL/ha)	Timing
Control	na		
Diuron IBS	830		IBS (14 May)
Reflex IBS	500		
Reflex IBS	750		
Terbyne Xtreme IBS	860		
Terrain Flow IBS	125		
Reflex IBS + Diuron IBS	500	830	
Diuron PSPE	550		PSPE (14 May)
Metribuzin PSPE	180		
Brodal EPE	100		EPE (15 July)
Brodal EPE	200		
Intercept EPE	600		
Diuron IBS + Broadstrike EPE	830	25	IBS (14 May) + EPE (15 July)
Diuron IBS + Brodal EPE	830	100	
Reflex IBS + Intercept EPE	500	600	

Results

The growing season rainfall (GSR) at Tepko was below average, with GSR (1 April – 31 October) totalling 143 mm (BushLinx – Paech Tepko Community) compared with the long-term average of 248 mm (BOM – Murray Bridge [Tepko]). A meaningful rainfall event (≥10 mm) did not occur until 26 – 27 May, when 10.2 mm was recorded.

Although the herbicide trial was initially intended as a crop safety assessment, the emergence of a dense capeweed population on the sandy rise site provided an opportunity to assess herbicide efficacy. Consequently, capeweed assessments were conducted to evaluate the effectiveness of herbicide selection and application timing. The variety trial located on the sandy rise was abandoned due to severe weed competition.

Sandy Rise – Herbicide Trial

Capeweed density on the sandy rise was assessed on 14 August, approximately four weeks after the EPE applications (15 July), allowing the full effects of the herbicide treatments to be observed.

Of the herbicide treatments evaluated, the combination of Diuron 830 IBS + Broadstrike 25 EPE provided the greatest suppression of capeweed establishment, reducing plant density to ~26 plants/m², compared with ~184 plants/m² in the untreated control (Figure 1). Most treatments significantly reduced capeweed density relative to the untreated control, except for Brodal EPE applications (200 and 100 mL/ha).

As the trials were dry sown with no emerged weeds, a knockdown herbicide was not applied prior to sowing. This allowed capeweed to emerge and establish following the opening rains, which likely contributed to the poor performance of the Brodal-only EPE treatments. When Brodal 100 EPE was applied in combination with Diuron 830 IBS, greater suppression of capeweed was observed compared with Diuron 830 IBS alone.

Overall, the most effective treatments incorporated either herbicide combinations applied at different timings (IBS + EPE), or multiple herbicides with different modes of action applied at a single IBS timing.

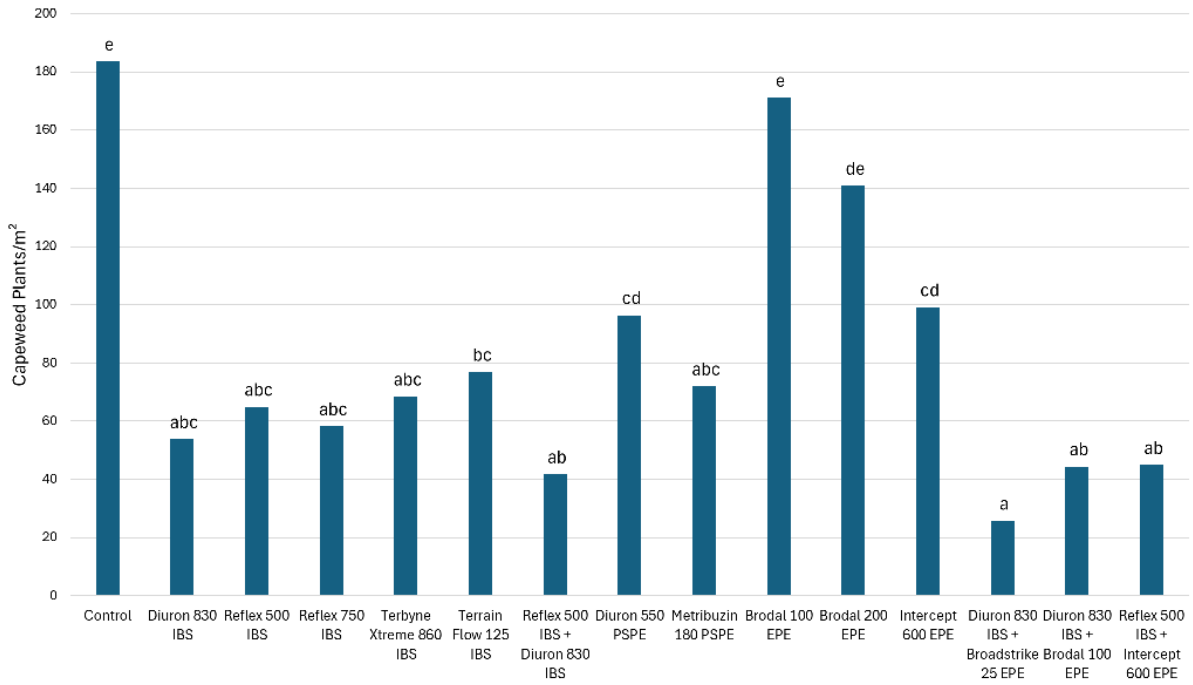


Figure 1. Capeweed density (plants/m²) in GIA Thunder lentil treated with different herbicides and timings on the sandy rise site at Tepko, 2025. Counts were conducted on 14 August. Columns sharing the same letter are not significantly different (P ≥ 0.05).

Loamy Flat – Herbicide Trial

Capeweed density was lower at the loamy flat site. Metribuzin 180 PSPE reduced capeweed density to ~1 plant/m², compared with ~9 plants/m² in the untreated control (Figure 2). All herbicide strategies, except for Diuron (830 IBS and 550 PSPE), Terrain Flow 125 IBS, Intercept 600 EPE, and Brodal 100 EPE, reduced capeweed populations to below ~4 plants/m².

In terms of crop safety and lentil establishment, reduced plant numbers were observed in the Terrain Flow 125 IBS treatment (Figure 3). This result is in line with label recommendations. The Terrain Flow label states its use on lighter soil types is not advised due to shorter periods of residual control and the potential for unacceptable crop damage (Nufarm, 2023). Rolling lentils prior to crop emergence is also not advised to prevent pushing an excessive amount of treated soil back into the furrow, reducing crop emergence. As the trials were sown on lighter soil types using an experimental plot seeder with a roller attachment, the result confirms the label recommendation.

Following the EPE herbicide applications, further germination and development of several broadleaf weed species, predominantly Indian Hedge Mustard, were observed in the trial area. However, additional weed population density assessments were not undertaken. Therefore, grain yield should be interpreted as an indirect indicator of overall weed competition rather than species specific. Of the included herbicide treatments, the most effective strategy was Reflex 500 IBS + Intercept 600 EPE, with lentil yielding 0.66 t/ha (Figure 4). Whilst Diuron 830 IBS + Broadstrike 25 EPE, along with Intercept 600 EPE and Metribuzin 180 PSPE treatments yielded 0.62, 0.53 and 0.54 t/ha, respectively.

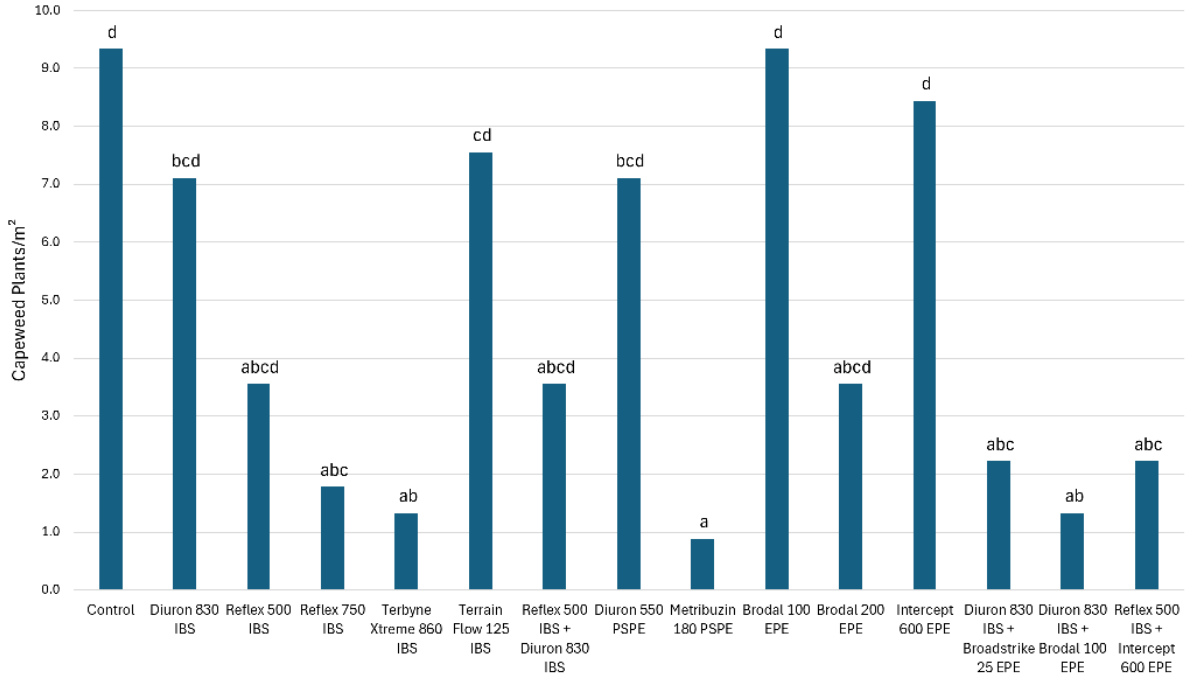


Figure 2. Capeweed density (plants/m^2) in GIA Thunder lentil treated with different herbicides and timings on the loamy flat site at Tepko, 2025. Counts were conducted on 14 August. Columns sharing the same letter are not significantly different (P ≥ 0.05).

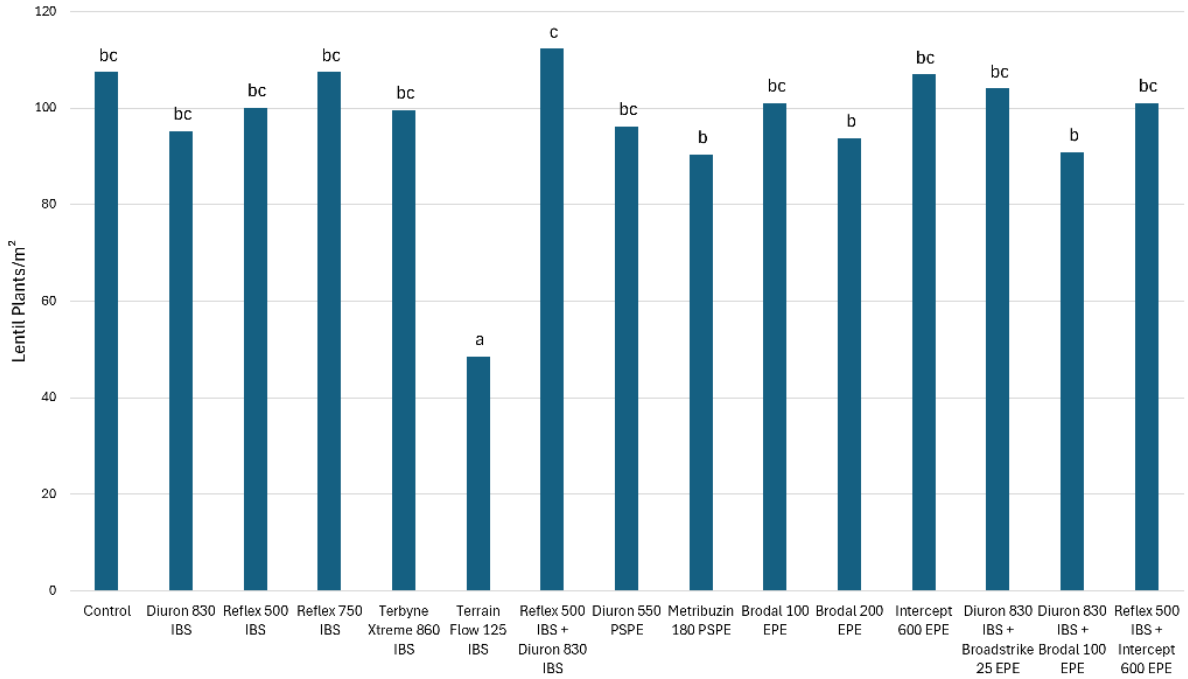


Figure 3. Establishment of GIA Thunder lentil (plants/m^2) treated with different herbicides and timings on the loamy flat site at Tepko, 2025. Counts were conducted on 4 September. Columns sharing the same letter are not significantly different (P ≥ 0.05).

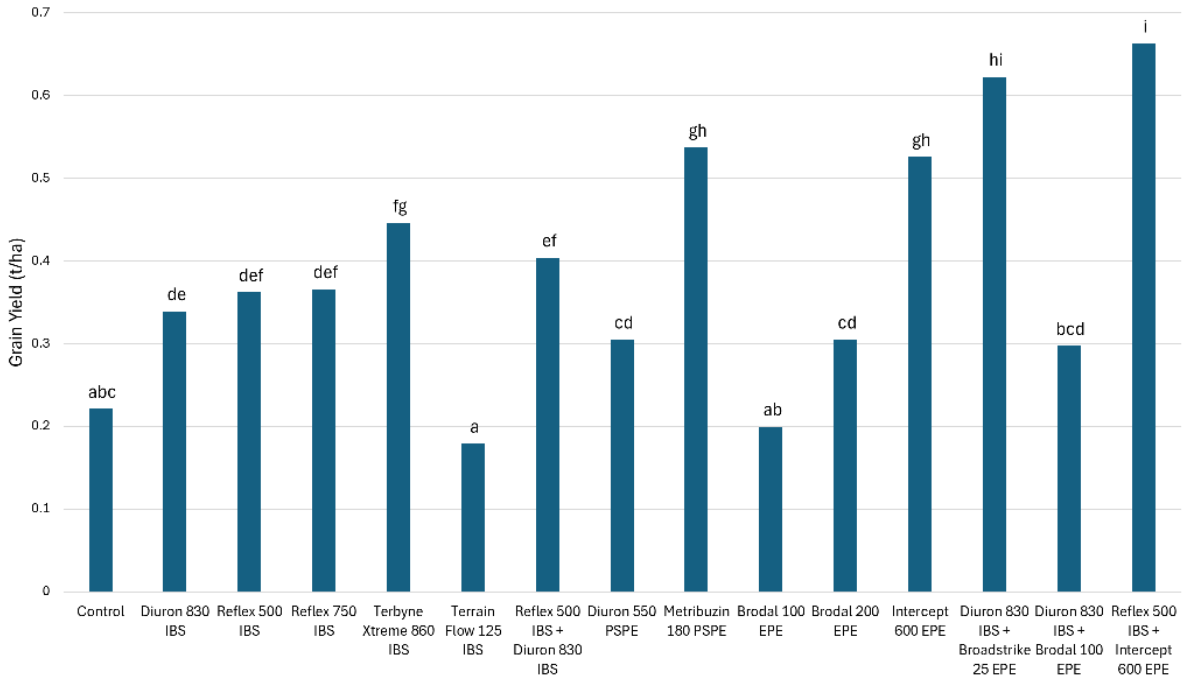


Figure 4. Grain yield (t/ha) of GIA Thunder lentil treated with different herbicides and timings on the loamy flat site at Tepko, 2025. Harvest was conducted on 18 November. Columns sharing the same letter are not significantly different (P ≥ 0.05).

Loamy Flat – Variety Trial

Of the cultivars evaluated in the variety trial on the loamy flat, PBA Highland XT was the highest yielding, with an average grain yield of 0.82 t/ha (Figure 5). ALB Terrier and GIA Metro yielded significantly less than the other varieties, producing 0.55 and 0.52 t/ha, respectively.

The lower yield performance of GIA Metro may be attributed to a fitness penalty associated with the target-site mutation in the chloroplast *psbA* gene, which can result in a reduced photosynthetic rate and consequently lower plant productivity (PB Seeds, 2023). However, GIA Metro possesses the only combined tolerance to metribuzin (MET) and imidazolinone herbicides (IMI). As such it may provide a useful option in environments with high weed pressure, as evident at the sandy rise trial site, where weed competition and/or limitations in currently available herbicide options prevented economically viable lentil production.

Further herbicide evaluations incorporating these tolerance technologies are required to determine their agronomic performance in this environment and assess their economic viability.

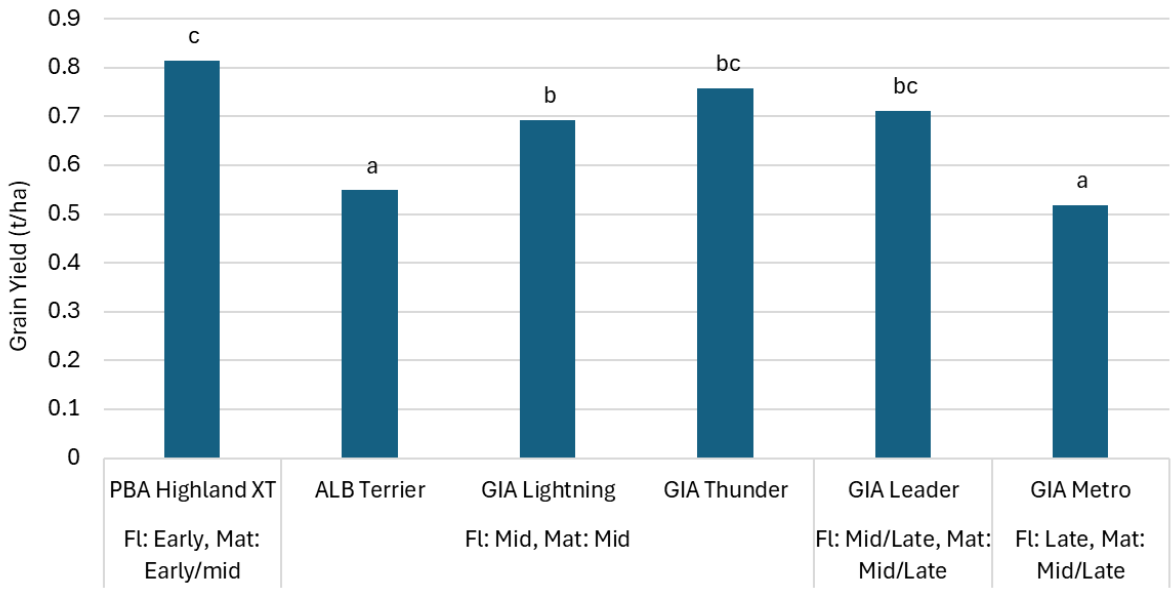


Figure 5. Grain yield (t/ha) of lentil varieties harvested on the loamy flat site at Tepko on 18 November, 2025. Lentil varieties are ordered according to their flowering and maturity classification. Columns sharing the same letter are not significantly different ($P \geq 0.05$).

Conclusions

This research provides regionally relevant evidence to support lentil production in the Murray Plains under dry and early sowing systems. Seasonal rainfall conditions in 2025 were below average, with delayed opening rainfall and high weed pressure highlighting the challenges associated with dry sowing.

Herbicide strategies incorporating multiple modes of action and staggered application timings (IBS + EPE) consistently provided the most effective weed suppression and resulted in improved crop performance. In particular, the combination of Diuron 830 IBS + Broadstrike 25 EPE provided strong capeweed suppression and competitive crop yields across the trials. In contrast, herbicide strategies relying solely on early post-emergent applications were less effective where weeds had already established prior to application.

Weed competition impacted lentil performance, with treatments providing stronger early weed control generally producing higher grain yields in the loamy flat herbicide trial.

While most herbicide treatments were well tolerated by the crop, reduced lentil establishment was observed where Terrain Flow was applied IBS, highlighting the importance of carefully considering label recommendations and soil suitability when selecting herbicide options.

Overall, the results demonstrate that effective early weed control through integrated herbicide strategies will be critical to improving the reliability and profitability of dry-sown lentil production in the Murray Plains, though multi-season evaluation will be required to confirm these findings across a range of seasonal conditions.

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