Project title: Blackcurrants: Refinement of the screening of herbicides for safe use in recently planted cuttings.

Project number: SF 154a

Project leader: Mike Hutchinson

Report: Final report – November 2016

Previous report: SF154 – November 2014

Key staff: John Keer (RAA Ltd.)

Michael Rodger (RAA Ltd.)

Location of project: Kington. Herefordshire. UK

Industry Representative: Rob Saunders

Date project commenced: 1st March 2016

Date project completed

(or expected completion date): November 2016

DISCLAIMER

[The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.]

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Dr. John Keer

Development Agronomist

Richard Austin Agriculture Limited

Signature ... *Keer* .... Date 14th November 2016

[Name]

[Position]

[Organisation]

Signature .... Date ....

Report authorised by:

[Name]

[Position]

[Organisation]

Signature .... Date ....

[Name]

[Position]

[Organisation]

Signature .... Date ....

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GROWER SUMMARY

Headline

- Refinement of an earlier herbicide screen has shown a range of herbicides to be suitable as potential replacements for Ronstar, to control annual weeds in newly planted blackcurrant cuttings.

Background and expected deliverables

The residual herbicide Ronstar (oxadiazon) has long been relied upon for weed control in newly planted blackcurrant cuttings, but the approval has not been maintained and it has already become difficult to obtain from distributors.

A previous herbicide screening trial showed products to offer variable levels of weed control and crop safety. Some of the most efficacious herbicides also showed the greatest levels of crop damage. This trial was designed to refine rates of the most promising treatments and design tank-mixes with broad spectrum weed control activity.

Summary of the project and main conclusions

A range of herbicides were applied to newly planted cuttings of blackcurrant (Ben Vane). The crop safety and weed control efficacy provided by these herbicides was assessed during the early growing season. Herbicide treatments were selected from promising candidate herbicides, evaluated in the earlier herbicide weed screen (SF 154).

The weed species occurring in this trial were *Poa annua* (Annual meadow-grass), *Matricaria spp.* (Mayweeds), *Galium aparine* (Cleavers) and *Cirsium spp.* (Thistles). However, weed numbers were too low to provide the most robust herbicide efficacy data.

Despite this and some waterlogging in areas of the trial, some promising data were obtained on the safe use of herbicides in newly planted blackcurrants.

A band spray between plant rows of Nirvana (4.5l) in combination with Flexidor (2.0l) sprayed over the plants, provided a safer option compared to when Nirvana (4.5l) was applied as an overall spray (which was found to be too phytotoxic in blackcurrant in previous experiments). The combination also gave good levels of weed control.

Artist (2.5kg) + Kerb (4.25l) and Devrinol (7.0l) + Kerb (4.25l) also provided good control of most of the weed species present with a good level of crop safety.

A range of other Nirvana containing tank-mixes showed only marginal crop safety and variable weed control levels.

Financial benefits

Blackcurrant plantations are estimated to be replaced at around 200 ha/pa. Financial benefits potentially arise from reduced requirement for hand weeding, which may cost £1,100/ha, and which may be reduced to virtually nothing through good herbicidal weed control. Also improved establishment – a mature plantation will produce around 7.5 tonnes/ha, valued at around £5,000, a figure which can quickly be reduced by 10% due to poor establishment or weed competition. Often, weed competition or herbicide growth check delays attaining full cropping yield by 1 year.

Action points for growers

- This study provides further information and pointers for agronomists and growers to adopt herbicide strategies which are suitable for their site, which, if implemented, will make establishment of new plantations more reliable.

SCIENCE SECTION

Introduction

A range of herbicides were applied to newly planted cuttings of blackcurrant (Ben Vane). The crop safety and weed control efficacy provided by these herbicides was assessed during the early growing season.

Materials and methods

EXPERIMENTAL DETAILS

Trial number: RAA 01-2016

Co-operator: James Wright

Whittern farms Limited

Next End, Lyonshall

Kington

Herefordshire HR5 3HZ

Site: Lyonshall

Kington. Herefordshire

Grid reference: SO352580

Soil type: Silt loam

Crop & Cultivar: Blackcurrant cuttings: variety Ben Vane

Planting Date: 03.03.2016

Field Preparation: Winter plough/press

Secondary cultivation

Hand plant

Previous treatments: Nil

Plot size: 3m X 8m

Design: Randomised complete block

X3 replication

Table 1. Treatment List.

	Treatment	Rate / ha	Timing
1	Untreated control		
2	*Flexidor/ Nirvana	2.0l / 4.5l	T1
3	Nirvana	1.125l	T1
4	Nirvana + Artist + Kerb	1.125l + 1.25kg + 4.25l	T1
5	Nirvana + Artist + Kerb	1.125l + 2.5kg + 4.25l	T1
6	Nirvana + Artist + Kerb	2.25l + 1.25kg + 4.25l	T1
7	Artist + Kerb	2.5kg + 4.25l	T1
8	Devrinol + Kerb	7.0l + 4.25l	T1

*Flexidor applied as a 20cm wide band, centred on crop row and Nirvana applied to remaining untreated soil.

T1 = Soon after planting – prior to weed emergence.

Table 2. Product List.

Product Name	Active ingredient	g/a.i.	Formulation
Artist	flufenacet + metribuzin	24% + 17.5% w/w	WG
Devrinol	napropamide	450g/l	EC
Flexidor	isoxaben	500g/l	SC
Kerb	propyzamide	400g/l	EC
Nirvana	pendimethalin + imazamox	250g/l+16.7g/l	SC

APPLICATION DETAILS

Applicator: GS plot sprayer - air pressurised (Pulvexpur - 3m)

> Nozzles: 015 F110 Lo Drift
>
> Pressure: 3.2 bar
>
> Speed: 1.0 m/s
>
> Water Volume: 200 l/ha

T1 – "early post-planting"

Date:	14.03.2016 – 11 days after planting
Crop Stage:	dormant cuttings
Leaf Moisture:	dry
Soil Moisture (Surface):	moist
Soil Moisture (Sub-surface):	moist
Soil Condition:	loose
Soil Tilth:	small clods
Weather at application:	Sunny
Air temperature (Deg. C):	12
Soil temperature (Deg. C):	7
Wind (kph):	2 – northeast
Cloud cover (%):	20
Comment:	Good spraying conditions. Adverse weather conditions delayed T1 application by one week.

ASSESSMENT METHODS

The following assessments were carried out on the trial:

At application

Soil and climatic data were collected at application:

- T1   14.03.2016   dormant cutting

Crop Phytotoxicity

Crop damage symptoms including vigour reduction (assessed as % vigour reduction compared to untreated control), chlorosis, necrosis and growth distortion were assessed as follows:

- 23DAT   06.04.2016   bud break
- 30DAT   13.04.2016   first fully unfolded leaf
- 57DAT   10.05.2016   plants 15cm height
- 123DAT   15.07.2016   plants 20cm height
- 158DAT   19.08.2016   plants 45cm height

(DAT – Days after treatment)

Weed control

Weed control was assessed as % weed biomass reduction compared with the untreated control. Biomass reduction was recorded for each major weed species present:

- 23DAT   06.04.2016   bud break
- 30DAT   13.04.2016   first fully unfolded leaf
- 57DAT   10.05.2016   plants 15cm height
- 123DAT   15.07.2016   plants 20cm height
- 158DAT   19.08.2016   plants 45cm height

Weed levels in the untreated control were recorded as % ground cover and number of each weed species per square metre (mean of 4 X 0.33 sq. m quadrats per untreated plot).

Results

Crop Phytotoxicity – chlorosis, leaf malformation and vigour reduction.

Table 3 – Crop phytotoxicity (% chlorosis) – 23DAT, 30DAT and 57DAT.

Crop Code Crop Scientific Name Crop Name Crop Variety Rating Date Rating Type Rating Unit Trt-Eval Interval ARM Action Codes	RIBNI Ribes nigrum Blackcurrant Ben Vane Apr-6-2016 PHYCHL % 23 DA-A AA	RIBNI Ribes nigrum Blackcurrant Ben Vane Apr-13-2016 PHYCHL % 30 DA-A AL	RIBNI Ribes nigrum Blackcurrant Ben Vane May-10-2016 PHYCHL % 57 DA-A
Trt No. Treatment Name			
1 Untreated	0.0b	0.0b	0.0c
2 Flexidor/Nirvana 2.0l + 4.5l	5.0a	9.3a	4.0a
3 Nirvana 1.125l	3.2a	5.0a	2.0abc
4 Nirvana + Artist + Kerb 1.125l + 1.25kg + 4.25l	4.4a	8.1a	2.0abc
5 Nirvana + Artist + Kerb 1.125l + 2.5kg + 4.25l	4.3a	9.2a	4.0a
6 Nirvana + Artist + Kerb 2.25l +1.25kg + 4.25l	4.7a	10.5a	3.3ab
7 Artist + Kerb 2.5kg + 4.25l	3.6a	6.3a	2.0abc
8 Devrinol + Kerb 7.0l 4.25l	2.6a	5.0a	1.3bc
LSD P=.05	4.29t	0.31t	2.04
Standard Deviation	2.45t	0.18t	1.16
CV	24.45t	21.91t	49.93
Replicate F	0.340	0.370	0.123
Replicate Prob(F)	0.7177	0.6973	0.8854
Treatment F	8.896	11.312	4.211
Treatment Prob(F)	0.0003	0.0001	0.0107

Crop Code
 RIBNI, BCUR, Ribes nigrum, = US
Rating Type
 PHYCHL = phytotoxicity - chlorosis
Rating Unit
 % = percent
ARM Action Codes
 AA = Automatic arcsine square root % transformation
 AL = Automatic log transformation of X+1
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.

Table 4 – Crop phytotoxicity (% leaf malformation) – 23DAT, 30DAT and 57DAT.

Crop Code Crop Scientific Name Crop Name Crop Variety Rating Date Rating Type Rating Unit Trt-Eval Interval ARM Action Codes	RIBNI Ribes nigrum Blackcurrant Ben Vane Apr-6-2016 PHYLMA % 23 DA-A AL	RIBNI Ribes nigrum Blackcurrant Ben Vane Apr-13-2016 PHYLMA % 30 DA-A AA	RIBNI Ribes nigrum Blackcurrant Ben Vane May-10-2016 PHYLMA % 57 DA-A
Trt No. Treatment Name			
1 Untreated	0.0d	0.0e	0.0a
2 Flexidor/Nirvana 2.0l + 4.5l	5.9c	12.3cd	0.0a
3 Nirvana 1.125l	6.3c	10.9cd	0.0a
4 Nirvana + Artist + Kerb 1.125l + 1.25kg + 4.25l	6.3c	10.0d	0.0a
5 Nirvana + Artist + Kerb 1.125l + 2.5kg + 4.25l	11.5b	20.0bc	0.0a
6 Nirvana + Artist + Kerb 2.25l +1.25kg + 4.25l	13.1b	24.9b	0.0a
7 Artist + Kerb 2.5kg + 4.25l	22.9a	45.0a	0.0a
8 Devrinol + Kerb 7.0l 4.25l	5.0c	10.9cd	0.0a
LSD P=.05	0.18t	7.11t	0.00
Standard Deviation	0.10t	4.06t	0.00
CV	11.85t	18.45t	0.0
Replicate F	0.853	0.175	0.000
Replicate Prob(F)	0.4472	0.8413	1.0000
Treatment F	46.403	26.031	0.000
Treatment Prob(F)	0.0001	0.0001	1.0000

Pest Type
 W, Weed, G-BYRW7, G-WedStg = Weed or volunteer crop
Crop Code
 RIBNI, BCUR, Ribes nigrum, = US
Rating Type
 PHYLMA = phytotoxicity - leaf malformation
Rating Unit
 % = percent
ARM Action Codes
 AL = Automatic log transformation of X+1
 AA = Automatic arcsine square root % transformation
 Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)
  t=Mean descriptions are reported in transformed data units, and are not de-transformed.

Table 5 – Crop phytotoxicity (% vigour reduction versus untreated) – 23DAT, 30DAT and 57DAT.

Crop Code Crop Scientific Name Crop Name Crop Variety Rating Date Rating Type Rating Unit Trt-Eval Interval ARM Action Codes	RIBNI Ribes nigrum Blackcurrant Ben Vane Apr-6-2016 VIGRED % 23 DA-A AA	RIBNI Ribes nigrum Blackcurrant Ben Vane Apr-13-2016 VIGRED % 30 DA-A	RIBNI Ribes nigrum Blackcurrant Ben Vane May-10-2016 VIGRED % 57 DA-A
Trt Treatment No.Name			
1 Untreated	0.0a	0.0a	0.0c
2 Flexidor/Nirvana 2.0l + 4.5l	0.0a	0.0a	6.0ab
3 Nirvana 1.125l	0.0a	0.0a	3.3b
4 Nirvana + Artist + Kerb 1.125l + 1.25kg + 4.25l	0.0a	0.0a	5.0ab
5 Nirvana + Artist + Kerb 1.125l + 2.5kg + 4.25l	0.0a	0.0a	5.0ab
6 Nirvana + Artist + Kerb 2.25l +1.25kg + 4.25l	0.0a	0.0a	7.7a
7 Artist + Kerb 2.5kg + 4.25l	0.0a	0.0a	0.0c
8 Devrinol + Kerb 7.0l 4.25l	0.0a	0.0a	0.0c
LSD P=.05	0.00t	0.00	2.65
Standard Deviation	0.00t	0.00	1.51
CV	0.0t	0.0	44.85
Replicate F	0.000	0.000	0.709
Replicate Prob(F)	1.0000	1.0000	0.5089
Treatment F	0.000	0.000	12.112
Treatment Prob(F)	1.0000	1.0000	0.0001

Crop Code
RIBNI, BCUR, Ribes nigrum, = US
Rating Type
VIGRED = vigor reduction
Rating Unit
% = percent
ARM Action Codes
AA = Automatic arcsine square root % transformation

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)
t=Mean descriptions are reported in transformed data units, and are not de-transformed.

Weed levels in the untreated control.

No weeds had emerged at the time of herbicide application – 14.03.2016

Table 6. Weed levels in untreated controls at - 10.05. 2016 (57DAT).

Weed species	Weeds / sq. m	Weed size
Matricaria spp. (Mayweeds)	7	6-8 true leaves
Galium aparine (Cleavers)	3	6cm across
Poa annua (Annual meadow-grass)	4	2-3 tillers
Cirsium spp.(Thistle)	4	5cm across

Weed levels were generally low across the trial area. Higher levels of weed infestation are required to make more confident comparisons of herbicide efficacy. Weeds were slow to develop and only present in sufficient numbers to allow a first assessment on 10.05.2016.

Weed control

Table 7. Assessment of weed control as % weed biomass reduction versus untreated control – 10.05.2016 (57DAT).

	MATSS	POAAN	CIRSS	GALAP
Pest Code				
Pest Scientific Name	Matricaria sp.	Poa annua	Cirsium sp.	Galium aparine
Pest Name	Mayweeds	Annual Meadow-grass	Thistle	Cleavers
Crop Code	RIBNI	RIBNI	RIBNI	RIBNI
Crop Scientific Name	Ribes nigrum	Ribes nigrum	Ribes nigrum	Ribes nigrum
Crop Name	Blackcurrant	Blackcurrant	Blackcurrant	Blackcurrant
Crop Variety	Ben Vane	Ben Vane	Ben Vane	Ben Vane
Rating Date	May-10-2016	May-10-2016	May-10-2016	May-10-2016
Rating Type	BIOMRE	BIOMRE	BIOMRE	BIOMRE
Rating Unit	%	%	%	%
Trt-Eval Interval	57 DA-A	57 DA-A	57 DA-A	57 DA-A
ARM Action Codes				
Trt No. / Treatment Name				
1 Untreated	0.0e	0.0d	0.0b	0.0b
2 Flexidor/Nirvana 2.0l + 4.5l	96.7a	98.3a	96.7a	100.0a
3 Nirvana 1.125l	76.7d	76.7c	85.0a	90.0a
4 Nirvana + Artist + Kerb 1.125l + 1.25kg + 4.25l	78.3cd	85.0bc	85.0a	95.0a
5 Nirvana + Artist + Kerb 1.125l + 2.5kg + 4.25l	95.0ab	100.0a	95.0a	100.0a
6 Nirvana + Artist + Kerb 2.25l +1.25kg + 4.25l	93.3ab	100.0a	96.7a	100.0a
7 Artist + Kerb 2.5kg + 4.25l	86.7bc	90.0ab	96.7a	100.0a
8 Devrinol + Kerb 7.0l 4.25l	100.0a	98.3a	98.3a	100.0a
LSD P=.05	8.52	10.04	12.84	12.33
Standard Deviation	4.86	5.73	7.33	7.04
CV	6.21	7.08	8.97	8.22
Replicate F	2.157	2.882	2.928	0.568
Replicate Prob(F)	0.1525	0.0895	0.0866	0.5794
Treatment F	136.151	104.249	62.404	73.270
Treatment Prob(F)	0.0001	0.0001	0.0001	0.0001

Rating Type
BIOMRE = biomas reduction
Rating Unit
% = percent
Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

Table 8. Assessment of weed control as % weed biomass reduction versus untreated control – 15.07.2016 (123DAT).

Pest Code Pest Scientific Name Pest Name Crop Code BBCH Scale Crop Scientific Name Crop Name Crop Variety Rating Date Rating Type Rating Unit Trt-Eval Interval ARM Action Codes	MATCH Matricaria chamomilla Scented Mayweed RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Jul-15-2016 BIOMRE % 123 DA-A	POAAN Poa annua Annual Meadow-grass RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Jul-15-2016 BIOMRE % 123 DA-A AA	CIRSS Cirsium sp. Thistle RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Jul-15-2016 BIOMRE % 123 DA-A	GALAP Galium aparine Cleavers RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Jul-15-2016 BIOMRE % 123 DA-A ER1
Trt Treatment No. Name				
1 Untreated	0.0	0.0	0.0	0.0
2 Flexidor/Nirvana 2.0l + 4.5l	80.0	20.0	80.0	90.0
3 Nirvana 1.125l	20.0	10.0	80.0	80.0
4 Nirvana + Artist + Kerb 1.125l + 1.25kg + 4.25l	10.0	10.0	10.0	10.0
5 Nirvana + Artist + Kerb 1.125l + 2.5kg + 4.25l	60.0	70.0	70.0	100.0
6 Nirvana + Artist + Kerb 2.25l +1.25kg + 4.25l	25.0	30.0	45.0	100.0
7 Artist + Kerb 2.5kg + 4.25l	15.0	60.0	65.0	100.0
8 Devrinol + Kerb 7.0l 4.25l	80.0	85.0	5.0	100.0
LSD P=.05 Standard Deviation CV Replicate F Replicate Prob(F) Treatment F Treatment Prob(F)	. . .	. . .	. . .	. . .

Rating Type
BIOMRE = biomas reduction
Rating Unit
% = percent
ARM Action Codes
AA = Automatic arcsine square root % transformation
ER1 = Excluded replicate 1

Data in Table 8 have not been statistically analysed, because only data from the first replicate have been included.

Table 9. Assessment of weed control as % weed biomass reduction versus untreated control – 19.08.2016 (158DAT).

Pest Code Pest Scientific Name Pest Name Crop Code BBCH Scale Crop Scientific Name Crop Name Crop Variety Rating Date Rating Type Rating Unit Trt-Eval Interval ARM Action Codes	MATCH Matricaria chamomilla Scented Mayweed RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Aug-19-2016 BIOMRE % 158 DA-A	POAAN Poa annua Annual Meadow-grass RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Aug-19-2016 BIOMRE % 158 DA-A	CIRSS Cirsium sp. Thistle RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Aug-19-2016 BIOMRE % 158 DA-A	GALAP Galium aparine Cleavers RIBNI BCUR Ribes nigrum Blackcurrant Ben Vane Aug-19-2016 BIOMRE % 158 DA-A ER1
Trt No. Treatment Name				
1 Untreated	0.0	0.0	0.0	0.0
2 Flexidor/Nirvana 2.0l + 4.5l	75.0	20.0	80.0	90.0
3 Nirvana 1.125l	20.0	10.0	80.0	80.0
4 Nirvana + Artist + Kerb 1.125l + 1.25kg + 4.25l	10.0	10.0	10.0	10.0
5 Nirvana + Artist + Kerb 1.125l + 2.5kg + 4.25l	60.0	70.0	70.0	100.0
6 Nirvana + Artist + Kerb 2.25l +1.25kg + 4.25l	25.0	30.0	45.0	100.0
7 Artist + Kerb 2.5kg + 4.25l	15.0	60.0	65.0	100.0
8 Devrinol + Kerb 7.0l 4.25l	80.0	85.0	5.0	100.0
LSD P=.05 Standard Deviation CV Replicate F Replicate Prob(F) Treatment F Treatment Prob(F)	. . .	. . .	. . .	. . .

Rating Type
BIOMRE = biomas reduction
Rating Unit
% = percent
ARM Action Codes
ER1 = Excluded replicate 1
Data in Table 9 have not been statistically analysed, because only data from the first replicate have been included.

Discussion

The trial site was subject to severe waterlogging, especially during the latter part of May and into June. Therefore, assessments made after the middle of May, of both weed control and crop safety were compromised. Crop effects due to waterlogging were difficult to distinguish from possible damage from herbicide treatments. Similarly, waterlogging affected weed growth and therefore masked herbicide activity.

In order to mitigate the problem of waterlogging, all assessments made after 10.05.2016 were confined to the first replicated block, which largely escaped water damage. However, this lack of replication prohibits statistical analysis, resulting in far less robust data from the later assessments.

No crop vigour reduction was observed for any herbicide treatment, at the "bud break" and "first leaf fully unfolded" growth stages. Significant (P=0.05) levels of vigour reduction were observed 57DAT for some herbicides, although such levels should be regarded as commercially acceptable.

Although crop vigour was largely unaffected by herbicides, levels of chlorosis and leaf malformation (leaf curling) were recorded. Leaf malformation was completely outgrown by the 57DAT assessment but chlorosis was observed throughout the season, albeit at commercially acceptable levels by 57DAT.

Nirvana containing treatments showed the highest levels of crop effect but the lower rates employed here, compared to those used in the initial herbicide screen – SF 154, appear acceptably safe. Band spraying previously unsafe rates of Nirvana (4.5l) away from the cuttings, in combination with Flexidor applied over the rows, was a marginally safe treatment, though logically it should be avoided on sites where a waterlogging risk exists, due to the potential of imazamox to move in water.

Artist (2.5kg) + Kerb (4.25l) and Devrinol (7.0l) + Kerb (4.25l) showed good levels of crop safety, though previous grower experience with the use of Devriol on one site prompts caution.

Weed numbers per species were too low to make conclusive comparisons between the efficacies of herbicides. However, Flexidor/Nirvana band sprays gave good control of the broadleaf weed species present. All herbicides provided good levels of weed control, although some treatments were very species specific.

Conclusions

The trial has shown the potential of banded sprays and tank mix options for the control of a range of weeds in newly planted blackcurrant cuttings. However, this work should be repeated for different soil types and seasons to build greater confidence in crop safety and efficacy.

Knowledge and Technology Transfer
N/A

Glossary
N/A

References

HDC Report SF 154. (2014) Blackcurrants: Screening herbicides for safe use in recently planted cuttings.

Appendices

Plates:

PLATE 1. UNTREATED CONTROL – 19.08.2016

PLATE 2. FLEXIDOR 2.0L / NIRVANA 4.5L BAND TREATMENT – 19.08.2016

PLATE 3. NIRVANA 1.125L – 19.08.2016

PLATE 4. NIRVANA 1.125L + ARTIST 1.25KG + KERB 4.25L – 19.08.2016

PLATE 5. NIRVANA 1.125L + ARTIST 2.5KG + KERB 4.25L – 19.08.2016

PLATE 6. NIRVANA 2.25L + ARTIST 1.25KG + KERB 4.25L – 19.08.2016

PLATE 7. ARTIST 2.5KG + KERB 4.25L – 19.08.2016

PLATE 8. DEVRINOL 7.0L + KERB 4.25L – 19.08.2016

PLATE 9. UNTREATED CONTROL IN BLOCK 2 SHOWING WATERLOGGING – 19.08.2016