ATTACHMENTS

ORDINARY COUNCIL MEETING

23 MAY 2017

Attachment No. 1

Ordinary Council Minutes of 28 March 2017

Attachment No. 2

Special Council Minutes of 9 May 2017

Attachment No. 3

- Evidence for a formal reconsideration of Glyphosate.
- Councillor Workshop 7 December 2016 – extract of agenda Item.
- EMRC Weed Control Booklet – preliminary findings May 2017.
- GreenSteam Australia quote (Confidential Attachment)

Attachment No. 4

Lot 54 (Nos. 72-74) Railway Parade, Bassendean

- Original Determination Notice (provided under the cover of correspondence from the DAP Secretariat dated 1 July 2015).
- Revised Drawings all dated 27 October 2015.
- Applicant's correspondence dated 31 March 2017.

Attachment No. 5

- Verge Treatment and Maintenance Policy;
- Permissible Verge Treatment Information Sheet;
- Activities on Thoroughfares and Trading in Thoroughfares and Public Place Local Law 2010;
- Photograph of the verge.
- Letter to owner at 115B Anzac Terrace regarding non-compliant verge treatment.

Attachment No. 6

- Public responses spreadsheet (names supressed)
- Final Water Quality in the Bassendean Drainage Network Report 2016.
- Confidential spreadsheet of responses

Attachment No. 7

- SIA Architects Pty Ltd - Schematic Design Option 1
- Lotterywest email 7 April 2017
- Lotterywest email dated 9 May 2017
- SIA Architects – 1 Surrey Street Order of Magnitude of Costs

Attachment No. 8

Notional Planning Precincts Map
Key Design Principles and Characteristics
SPP 4.2 – 'Centres' Hierarchy
Ped-shed Illustration
Urban Structure Diagram
Notional Bassendean Ped-sheds Map

Attachment No. 9

Community Events Sponsorship Application

Attachment No. 10

Little Italy Street Festival Extravaganza Spring Sagra
Proposal and Budget

Attachment No. 11

Draft 2017-2027 Strategic Community Plan

Attachment No. 12

- Bassendean River Parks Management Committee Minutes of 3 May 2017.
- Aerial Map of Ashfield Flats Reserve – WAPC Cadastral land ownership.

Attachment No. 13

Local Studies Collection Management Committee Minutes of 4 May 2017.

Attachment No. 14

Access and Inclusion Committee Minutes of 10 May 2017.

Attachment No. 15

List of Accounts

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Financial Statements

ATTACHMENT NO. 1

TOWN OF BASSENDEAN
MINUTES
ORDINARY COUNCIL MEETING
26 APRIL 2017

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TOWN OF BASSENDEAN

MINUTES

ORDINARY COUNCIL MEETING

HELD IN THE COUNCIL CHAMBER, 48 OLD PERTH ROAD, BASSENDEAN

ON WEDNESDAY 26 APRIL 2017 AT 7.00PM

1.0 DECLARATION OF OPENING/ANNOUNCEMENT OF VISITORS

The Presiding Member declared the meeting open, welcomed all those in attendance and acknowledged the past and present traditional owners and custodians of the land on which the meeting was being held.

2.0 PUBLIC QUESTION TIME & ADDRESS BY MEMBERS OF THE PUBLIC

2.1 Public Question Time

Ms Kathryn Hamilton, 53 Broadway Street, Bassendean

Ms Hamilton asked why she is still waiting on information in relation to Ashfield Reserve, as requested at the March Ordinary Council Meeting.

The CEO advised that he is waiting on information from the relevant Officers.

Ms Hamilton asked if the Council is in breach of the Local Government Act by not responding within the appropriate timeframe.

The CEO stated that he has responded to Ms Hamilton, and has advised Ms Hamilton that she will be provided with the information once it is available.

Ms Hamilton asked why the concrete batching plant development application went straight to the State Administrative Tribunal (SAT) without going to Council.

The Manager Development Services advised that the applicant appealed to the SAT because the application was not determined within the required timeframe.

Ms Hamilton asked why the application was not determined within the required timeframe.

The Manager Development Services responded that Town officers requested further information of the applicant and receipt of that information exceeded the timeframe, the applicant then made an appeal to the SAT.

Ms Hamilton asked if the public submissions were made available to the Councillors or were they just provided with a summary.

The Manager Development Services responded that the Councillors were provided with a full copy of the submissions plus a summary of the submissions.

Ms Hamilton asked if an appeal can be made to the Premier or other government department if the applicant has not represented truthfully what the productions levels will be.

The Manager Development Services responded that production is capped to an annual amount and the applicant needs to provide the Town with a quarterly report on the volumes produced.

Ms Hamilton commented on the need to consider setting up air monitoring.

The Manager Development Services advised that within three days of the last Council Meeting he was in contact with an external environmental consultant. There have been follow-up emails but no response as yet.

Ms Nonie Jekabsons, 6 Barton Parade, Bassendean

Ms Jekabsons asked if approval is required to demolish outbuildings and clear a block and the Manager Development Services responded that a demolition permit is required.

Ms Jekabsons asked if you need permission to install an item in a verge tree, such as a surveillance camera and the Director Operational Services responded that permission is required.

Ms Fran Phelan, 15 River Street, Bassendean

Ms Phelan asked what is happening about the bore at Success Hill.

The Director Operational Services advised that the contract has been issued and work is expected to commence very soon.

Mrs Val Dreyer, 31 Naunton Crescent, Eden Hill

Mrs Dreyer asked about the kerbing on the corner of Iolanthe and Anzac Terrace that is coming away from the footpath.

The Director Operational Services advised that Town staff will inspect it.

Mrs Dreyer asked if action is taken by the Town on untidy properties.

The CEO responded that the Town does issue clean up orders on properties.

Mrs Dreyer complimented Town staff on the Anzac Day service.

Mr Bruce Keay, 11 Earlsferry Court, Bassendean

Mr Keay commented on the strategic planning review and expressed his concern that Council conducts suitable communication consultation early on.

The Director Strategic Planning advised that the Town has been looking at a number of online platforms where we can disseminate information and receive feedback from residents, and are hoping to roll something out in the next few weeks.

Mr Keay asked if the Council has considered establishing a community action network group, like Ashfield CAN north of the line.

The CEO commented that AshfieldCAN was grown from the residents.

The Director Community Development commented that the Town would welcome the development of a CAN group in the northern part of the Town, but it needs to be driven by the community and be their own entity.

Mr Don Yates, 10 Thompson Road, Bassendean

Mr Yates asked who is responsible for incorporating mandatory state planning policies into the Town's Local Planning Scheme.

The CEO responded that the question has been answered in writing multiple times.

The Manager Development Services commented that the R Codes are incorporated into the scheme by reference. The developer contribution policy is not a mandatory policy that needs to be applied to the Planning Scheme.

2.2 Address by Members of the Public

It should be noted that public statements are not recorded in the minutes.

Mrs Anne Brinkworth, Freeman of the Town of Bassendean

Mrs Brinkworth expressed her appreciation to Town staff on a wonderful Anzac Day service and the grounds and maintenance of the gardens was wonderful. She asked that her comments be recorded in the Minutes.

3.0 ATTENDANCES, APOLOGIES AND APPLICATIONS FOR LEAVE OF ABSENCE

Present

Councillors

Cr John Gangell, Mayor
Cr Mike Lewis, Deputy Mayor
Cr Gerry Pule
Cr Paul Bridges (from 7.01pm)
Cr Bob Brown
Cr Renee McLennan (from 7.01pm)

Officers

Mr Bob Jarvis, Chief Executive Officer
Mr Michael Costarella, Director Corporate Services
Mr Graeme Haggart, Director Community Development
Mr Simon Stewert-Dawkins, Director Operational Services
Mr Anthony Dowling, Director Strategic Planning
Mr Brian Reed, Manager Development Services
Mrs Amy Holmes, Minute Secretary

Public

Approximately 16 members of the public were in attendance.

Press

One member of the press was in attendance.

4.0 DEPUTATIONS

4.1 Ms Val Humphries addressed the Council on Item 10.7.
4.2 Mr Balraj Hansra (Owner) addressed the Council on Item 10.2.
4.3 Mr Alessandro Stagno of Planning Solutions (Applicant) addressed the Council on Item 10.5.
4.4 Ms Natasha Kepit, from the Bassendean Preservation Group, addressed the Council on Item 11.2.

5.0 CONFIRMATION OF MINUTES

5.1 Ordinary Council Meeting held on 28 March 2017

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 5.1(a)

OCM – 1/04/17 MOVED Cr Pule, Seconded Cr Lewis, that the minutes of the Ordinary Council Meeting held on 28 March 2017, be received.

CARRIED UNANIMOUSLY 6/0

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 5.1(b)

OCM – 2/04/17 MOVED Cr Lewis, Seconded Cr Pule, that the minutes of the Ordinary Council Meeting held on 28 March2017, be confirmed as a true record.

CARRIED UNANIMOUSLY 6/0

6.0 ANNOUNCEMENT BY THE PRESIDING PERSON WITHOUT DISCUSSION

Nil

7.0 PETITIONS

Nil

8.0 DECLARATIONS OF INTEREST

Nil

9.0 BUSINESS DEFERRED FROM PREVIOUS MEETING

Nil

9.1 Notice of Motion - Cr Bridges: 1 Surrey Street Project

COUNCIL RESOLUTION – ITEM 9.1

OCM – 3/04/17 MOVED Cr Bridges, Seconded Cr Brown, that with relation to the 1 Surrey Street project Council:

1. Rescinds motion OCM-6/11/15, which reads:

   "MOVED Cr Pule, Seconded Cr Brown, that Council:

   1. *Receives the SIA Architects Pty Ltd progress report regarding the design options for the restoration, reconstruction and refurbishment of 1 Surrey Street project;*

   2. *Notes the feedback received from Bassendean Historical Society Inc Bassendean Arts Council Inc. the 1 Surrey Steering Group members, the State Heritage Office and Museums Australia concerning the various schematic design options;*

3. *Endorses SIA Architects Pty Ltd Option 2C draft design proposal, as included as an attachment to the Ordinary Council Agenda of 24 November 2015, to demolish the c.1952 rear extension under concrete roof and the standalone ablution/laundry building and the proposal to construct a separate building (Community Meeting Place) on the southern side of the Residence, as well as a separate toilet block on the western boundary;*

4. *Requests SIA Architects Pty Ltd re-align the proposed studio in Option 2C designs to achieve a North /South access in order to preserve the existing mature tree and increase the backyard usable space;*

5. *Requests SIA Architects Pty Ltd give due consideration in Phase 3 of the Detailed Design, Development & Documentation process to provide acoustic separation (shutters, walls & doors) in the 2C design to ensure the dual use of the kitchen area can be achieved for the Museum and / or Community/arts activities;*

6. *Requests SIA Architects Pty Ltd reinstate the gable eave overhang as per the original fabric of the Pensioner Guard Cottage, and;*

7. *Notes that the Community Development Directorate intends to provide a Governance Model report in the future for the 1 Surrey Street to guide the ongoing management of the facility.*

CARRIED 4/2;

2. Informs LotteryWest that the current grant application will be resubmitted pending completion of items 3-7 below;

3. Has plans prepared consistent with Option 1 prepared by the SIA architects and the building uses recommended in the Interpretation Plan and subject to modifications sought by the key user groups as previously documented being included;

4. Requires interpretation within the museum space to include original and reproduction artefacts and within the cottage to include interpretation of a standard commensurate with that of the Howick Historical Village in Auckland New Zealand to create an authentic experience for museum visitors;

5. Requires a management plan for the ongoing use of the site to be presented to the Audit and Risk Committee and adopted by Council;

6. Requires site use areas be defined for the museum component, dedicated work and storage space for the Bassendean Arts Council and common shared meeting and activity spaces for multiple user groups including capacity for school education programs; and

7. Requires site and building plans, costings, the management plan and the details of the proposed interpretation be made available to the public via the Town's website and presented at a public meeting for community input prior to the commencement of construction.

CARRIED 4/2

Crs Bridges, Brown, Lewis & McLennan voted in favour of the motion. Crs Gangell & Pule voted against the motion.

10.0 REPORTS

10.1 Adoption of Recommendations En Bloc

It was agreed that items 10.2 & 10.5 be removed from the en-bloc table and considered separately, and Item 10.7 be withdrawn.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.1

OCM – 4/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council adopts en bloc the following Officer recommendations contained in the Ordinary Council Agenda of 26 April 2017:

Item	Report
10.3	Proposed Amendment No. 71 to the City of Bayswater Town Planning Scheme No. 24 – Modifications to Special Control Area No. 10 – Lot 10 (Nos. 2–4) Railway Parade, Bayswater
10.9	Review of Workforce Plan and Corporate Structure
10.12	Liveable Town Advisory Committee held on 11 April 2017
10.13	Determinations Made by the Principal Building Surveyor
10.14	Determinations Made by Development Services
10.15	Quarterly Report for Quarter Ended 31 March 2017
10.16	Use of the Common Seal
10.17	Calendar for May 2017
10.18	Implementation of Council Resolutions
10.19	Accounts for Payment – March 2017

CARRIED UNANIMOUSLY 6/0

Council was then requested to consider the balance of the Officer recommendations independently.

Item	Report
10.2	Request for Council to develop a policy on rights-of-way and to modify a condition of planning approval for 3 Grouped Dwellings Lot 746 (No 9) Broadway, Bassendean
10.4	Red Post Box Group, inclusive of VR 1876 Post Box, Bassendean located at the corner of Surrey Street and North Road, to be listed on the State Register of Heritage Places,
10.5	Joint Metropolitan Central Development Assessment Panel Application for Convenience Store – Lot 25 (No. 300) Collier Road, Bassendean
10.6	Extension of Time for Prosecution Action to Remove Unauthorised Patio at Lot 19; No. 15 Bridson Street, Bassendean
10.8	Code of Conduct Review
10.10	2017-2027 Strategic Community Plan
10.11	WALGA Annual General Meeting 2017 – Submission of Motions
10.20	Financial Statements – March 2017
13.1	Business Case Report for the Potential Purchase by the Town of 10-14 Parker Street, Bassendean
13.2	11 Hamilton Street, Bassendean
13.3	Appointment of Community Members to Vacant Positions on the Audit and Risk Management Committee and Liveable Town Advisory Committee

10.2 Request for Council to develop a policy on rights-of-way and to modify a condition of planning approval for 3 Grouped Dwellings Lot 746 (No 9) Broadway, Bassendean – Owner: Balraj Hansra (Ref: DABC/BDVAPPS/2017-056 - Brian Reed, Manager Development Services)

APPLICATION

The purpose of this report was for Council to consider:

- A request to develop a policy dealing with the upgrading of rights-of-way; and
- The deletion of a condition of planning approval that requires the landowner to upgrade the existing right-of-way that will provide the only vehicular access to the site.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION — ITEM 10.2

OCM – 5/04/17 MOVED Cr Bridges, Seconded Cr Gangell, that Council:

1. Refuses the application to modify condition 12 of the planning approval for three grouped dwellings at Lot 746 (No 9) Broadway, Bassendean, issued on 25 November 2014 for the following reasons:

   a) The means of access to the site would be contrary to Clause C5.1 of the Residential Design Codes which requires that where access is taken from a right-of-way, the right-of-way is required to be paved and drained from the property boundary to a constructed street;

   b) The proposed means of access to and egress from the site are considered to be inadequate in accordance with clause 67(s) of the deemed provisions for local planning schemes which are incorporated into the Local Planning Scheme No. 10; and

2. Advises the applicant that Council intends to develop a comprehensive policy dealing with rights-of-way commencing the second half of the 2017 calendar year.

CARRIED 4/2

Crs Bridges, Gangell, McLennan& Lewis voted in favour of the motion. Crs Pule & Brown voted against the motion.

10.3 Proposed Amendment No. 71 to the City of Bayswater Town Planning Scheme No. 24 – Modifications to Special Control Area No. 10 – Lot 10 (Nos. 2–4) Railway Parade, Bayswater (Ref: GOVR/LREGLIA/2 - Christian Buttle, Senior Planning Officer)

APPLICATION

The purpose of this report was for Council to consider and provide comment to the City of Bayswater on proposed Amendment No. 71 to the City of Bayswater Town Planning Scheme No. 24 which seeks to make modifications to Special Control Area (SCA) No. 10 at Nos. 2-4 Railway Parade, Bayswater.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION — ITEM 10.3

OCM – 6/04/17 MOVED Cr Brown, Seconded McLennan, that Council advises the City of Bayswater that it has no objection in general to proposed Amendment No. 71 to the City of Bayswater District Planning Scheme No. 24 (DPS24), subject to the City:

(a) Clarifying permissibility of land uses, particularly within precincts B and C, and amending the Scheme Amendment documentation accordingly;
(b) Clarifying whether those land uses deemed undesirable in Precinct B by reason of noise, odour or atmospheric emissions will also be prohibited in Precinct C and amending the Scheme Amendment documentation accordingly;
(c) Incorporating land use definitions within DPS24 for all land uses identified within the Scheme Amendment documentation;
(d) Modifying "Table 1: Comparison of Car Parking Requirements Across Local Authorities" on page 25 of the Scheme Amendment report to remove the incorrect parking figures that have been attributed to the Town of Bassendean and replacing with the following correct figures:
    (i) Factory – 1:50 GFA; and
    (ii) Warehouse – 1:100 GFA;
(e) Maintaining a parking requirement of 1 bay per 50 sq.metres of floor area for Factory land use (as currently applies within the City and which is consistent with local government industry practice) in lieu of the 1 bay per 75 sq.metres of floor area which is advocated within the Scheme Amendment documentation;
(f) Modifying discussion on page 26 of the Scheme Amendment report which incorrectly refers to a parking ratio of 1 bay per 75 sq.metres of floor are being an improvement to the parking requirements specified within the Town of Bassendean when it is not;
(g) Modifying discussion on page 26 of the Scheme Amendment report which incorrectly compares a proposal to establish on street car parking on one side of the road carriageway to an established arrangement within the Town of Bassendean when no such arrangement exists; and

(h) Noting that any proposal to establish on street parking on one side of the road carriageway may create future conflicts with vehicle movements in the estate when, by virtue of the size of the commercial vehicle that is being used to service a given development, such vehicle requires the entire width of the road carriageway for manoeuvring purposes.

CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.4 Red Post Box Group, inclusive of VR 1876 Post Box, Bassendean located at the corner of Surrey Street and North Road, to be listed on the State Register of Heritage Places, Correspondent: Heritage Council of Western Australia (Ref: LUAP/REGSTN/1 - Timothy Roberts, Planning Officer)

APPLICATION

The purpose of this report was to consider whether Council wishes to make comment on a proposal to include the Red Post Box Group, inclusive of VR 1876, Bassendean, located at the corner of Surrey Street and North Road, on the State Register of Heritage Places. Council is also invited to nominate a person to attend the meeting at which the proposed registration of a place will be considered.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION — ITEM 10.4

OCM – 7/04/17 MOVED Cr Bridges, Seconded Cr Brown, that Council:

1. Supports the registration of the Red Post Box at the corner of Surrey Street and North Road, Bassendean on the State Register of Heritage Places.

2. Accepts the invitation to attend the Heritage Council meeting during which the registration of the above place will be considered; and appoints Councillor **Pule** as Council's representative to attend.

CARRIED UNANIMOUSLY 6/0

10.5 Joint Metropolitan Central Development Assessment Panel Application for Convenience Store – Lot 25 (No. 300) Collier Road, Bassendean, Owner: HICON (WA) PTY LTD, Applicant: Planning Solutions (Ref: DABC/BDVAPPS/2017-033 - Dylan Stokes, Planning Officer,)

APPLICATION

At its Ordinary Council Meeting held in May 2011, Council resolved to require that all Joint Development Assessment Panel (JDAP) applications be the subject of a report to Council in order that Council can make an alternative recommendation to the Metropolitan Central JDAP, should it see fit.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.5

OCM – 8/04/17 MOVED Cr Brown, Seconded Cr Bridges, that Council endorses the Planning Officer's report and recommendation to the Metropolitan Central Joint Development Assessment Panel for the proposed convenience store on Lot 25 (No. 300) Collier Road, Bassendean.

CARRIED UNANIMOUSLY 6/0

10.6 Extension of Time for Prosecution Action to Remove Unauthorised Patio at Lot 19; No. 15 Bridson Street, Bassendean – Property Owner: Kevin Prior (Ref: DABC/BDVAPPS/2017-005 – Dylan Stokes, Planning Officer)

APPLICATION

The purpose of this report was for Council to consider an extension of time to commence legal action for an unauthorised patio located at Lot 19, No. 15 Bridson Street, Bassendean.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.6

OCM – 9/04/17 MOVED Cr Pule, Seconded Cr McLennan, that Council revokes point 2 of OCM – 4/02/17 which reads: *"Authorises the Chief Executive Officer to initiate legal action if the unauthorised patio is not removed within 60 days of the date of refusal"* and replaces it with: *"Authorises the Chief Executive Officer to initiate legal action if the unauthorised patio is not removed within 90 days of the date of refusal."*

CARRIED BY AN ABSOLUTE MAJORITY 6/0

10.7 Surrey Street Community Centre Management Plan Incorporating the Pensioner Guard Museum (Ref: A673, COUP/PROGM/1 - Graeme Haggart, Director Community Development)

This Item was withdrawn.

10.8 Code of Conduct Review (Ref: GOVN/CCLMEET/1 - Bob Jarvis, CEO)

APPLICATION

Council was requested to adopt the revised Code of Conduct pursuant to Section 5.103 of the Local Government Act 1995.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION - ITEM 10.8

OCM – 10/04/17 MOVED Cr Pule, Seconded Cr Brown, that Council adopts the amended Town of Bassendean Code of Conduct for Councillors, Committee Members and Employees, as attached to the Ordinary Council Agenda of 26 April 2017.
CARRIED BY AN ABSOLUTE MAJORITY 6/0

10.9 Review of Workforce Plan and Corporate Structure (Ref: GOVR/LREGLIA/15 – Corporate Management Team)

APPLICATION

Council was requested to consider the adoption of the revised Workforce Plan for the 2017- 2021 financial years.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION — ITEM 10.9

OCM – 11/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council:

1. Amends the Corporate Structure to include the additional positions within the 2017-2021 Workforce Plan; and

2. Considers allocating funding for the additional positions in the 2017/18 Budget.

CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.10 2017-2027 Strategic Community Plan (Ref: CORM/POLCY/1- Bob Jarvis, CEO and the Executive Management Team)

APPLICATION

The purpose of the report was for Council to adopt the 2017-2027 Strategic Community Plan following the Community surveys and workshops as well as Councillor workshops held in March and April 2017.

OFFICER RECOMMENDATION – ITEM 10.10

That Council:

1. Adopts the 2017-2027 Strategic Community Plan, attached to the Ordinary Council Agenda of 26 April 2017; and

2. In accordance with Section 5.56 of Local Government Act and Administration Regulation 19D, give local, public notice of the adoption of the 2017-2027 Strategic Community Plan.

It was agreed that this item be deferred to a Special Meeting of Council.

COUNCIL RESOLUTION – ITEM 10.10

OCM – 12/04/17 MOVED Cr Pule, Seconded Cr Lewis, that this item be deferred for consideration at a Special Meeting of Council.
CARRIED BY AN ABSOLUTE MAJORITY 6/0

10.11 WALGA Annual General Meeting 2017 – Submission of Motions (Ref: GOVR/LREGLIA/3 - Sue Perkins, Executive Assistant)

APPLICATION

The purpose of this report was for Council to consider whether it wishes to put forward any motions for inclusion on the Agenda for the 2017 WALGA Annual General Meeting.

OFFICER RECOMMENDATION – ITEM 10.11

That Council considers whether it wishes to put forward any motions for inclusion on the Agenda for the 2017 WALGA Annual General Meeting to be held on Wednesday 2 August 2017.

The motion lapsed for want of a mover.

10.12 Liveable Town Advisory Committee held on 11 April 2017 (Ref: GOVN/CCL/MEET/34 – Graeme Haggart, Director Community Development)

APPLICATION

The purpose of this report was for Council to receive the report on a meeting of the Liveable Town Advisory Committee held on 11 April 2017.

COUNCIL RESOLUTION/COMMITTEE RECOMMENDATION – ITEM 10.12

OCM – 13/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council:

1. Receives the report of the meeting of the Liveable Town Advisory Committee held on Tuesday 7 February 2017;

2. Provides sponsorship of $1,000 under the Community Events Sponsorship Program in 2016/17 to Artsource to assist with the staging of the "Aim to Please" exhibition from 28 October to 5 November 2017 at Another Project Space, Ashfield Artsource Studios, 174 Railway Parade, Bassendean; and

3. Notes that a sponsorship agreement will be prepared in line with Council's policy between the Town and Artsource to outline the conditions of the sponsorship.

CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.13 Determinations Made by the Principal Building Surveyor Ref: LUAP/PROCED/1 – Mary Bidstrup, Administration Officer)

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.13

OCM – 14/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council notes the decisions made under delegated authority by the Principal Building Surveyor.

CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.14 Determinations Made by Development Services (Ref: LUAP/PROCED/1 – Brian Reed, Manager Development Services)

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.14

OCM – 15/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council notes the decisions made under delegated authority by the Manager Development Services.
CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.15 Quarterly Report for Quarter Ended 31 March 2017 (Ref: FINM/AUD/1 – Bob Jarvis, Chief Executive Officer)

APPLICATION

The purpose of this report was for Council to receive the Quarterly Report for the period ended 31 December 2016.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.15

OCM – 16/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council receives the Quarterly Report for the quarter ended 31 March 2017.
CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.16 Use of the Common Seal (Ref: INFM/INTPROP/1 – Sue Perkins, Executive Assistant to the CEO)

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.

OCM – 17/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council notes that the Common Seal was not attached to any documents during the reporting period.
CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.17 Calendar for May 2017 (Ref: Sue Perkins, Executive Assistant)

COUNCIL RESOLUTION/OFFICER RECOMMENDATION - ITEM 10.17

OCM – 18/04/17 MOVED Cr Brown, Seconded Cr McLennan, that the Calendar for May 2017 be adopted.
CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.18 Implementation of Council Resolutions (Ref: Sue Perkins, Executive Assistant)

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.18

OCM – 19/04/17 MOVED Cr Brown, Seconded Cr McLennan, that the outstanding Council resolutions detailed in the table listed in the Ordinary Council Meeting Agenda of 26 April 2017 be deleted from the Implementation of Council Resolutions list.
CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.19 Accounts for Payment – March 2017 (Ref: FINM/CREDTS/4 – Ken Lapham, Manager Corporate Services)

APPLICATION

The purpose of this report was for Council to receive the Accounts for Payment in accordance with Regulation 13 (3) of the Local Government (Financial Management) Regulations 1996.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION - ITEM 10.19

OCM – 20/04/17 MOVED Cr Brown, Seconded Cr McLennan, that Council receives the List of Accounts paid for March 2017, as attached to the Ordinary Council Agenda of 26 April 2017.
CARRIED UNANIMOUSLY BY EN BLOC RESOLUTION – OCM-4/04/17 6/0

10.20 Financial Statements – March 2017 (Ref: FINM/AUD/1 – Ken Lapham, Manager Corporate Services)

APPLICATION

The Local Government Financial Management Regulations, Clause 34(1) requires that a monthly financial report be presented to Council. A Local Government is to prepare each month a statement of financial activity that clearly shows a comparison of the budget estimates with the actual revenue and expenditure figures for the year to date.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 10.20

OCM – 21/04/17 MOVED Cr Lewis, Seconded Cr Pule, that the:

1. Financial Report for the period ending 31 March 2017, as attached to the Ordinary Council Agenda of 26 April 2017, be received; and

2. Budget amendments listed for adoption in the Financial Statements as attached to the Ordinary Council Agenda of 26 April 2017, be approved.

CARRIED BY AN ABSOLUTE MAJORITY 6/0

11.0 MOTIONS OF WHICH PREVIOUS NOTICE HAS BEEN GIVEN

11.1 Notice of Motion – Cr Pule: Request the State Administrative Tribunal to Review the Approval of the Concrete Batching Plant in Clune Street, Bassendean

COUNCIL RESOLUTION – ITEM 11.1

OCM – 22/04/17 MOVED Cr Pule, Seconded Cr Bridges, that the Town of Bassendean writes to the State Premier and Minister for Environment seeking a review of the Works Approval issued by the Department of Environment Regulation for the proposed concrete batching plant at Lot 105 No 2 Clune Street Bassendean, on the grounds of community concerns and better environmental standards.

CARRIED UNANIMOUSLY 6/0

11.2 Notice of Motion – Cr Bridges: Bassendean Preservation Group

COUNCIL RESOLUTION – ITEM 11.2

OCM – 23/04/17 MOVED Cr Bridges, Seconded Cr Pule, that Council Officers liaise with representatives from the Bassendean Preservation Group (Incorporated) and provide a report on the feasibility and costs involved in the relocation of the BPG GroCentre currently based in Ascot to the Council owned lot at 87 Whitfield Street, Bassendean.

CARRIED UNANIMOUSLY 6/0

12.0 ANNOUNCEMENTS OF NOTICES OF MOTION FOR THE NEXT MEETING

Nil

13.0 CONFIDENTIAL BUSINESS

COUNCIL RESOLUTION – ITEM 13.0(a)

OCM – 24/04/17 MOVED Cr Bridges, Seconded Cr Lewis, that the meeting go behind closed doors in accordance with Section 5.23 of the Local Government Act 1995, the time being 9.13pm.

CARRIED UNANIMOUSLY 6/0

All members of the public vacated the Chamber, the time being 9.13pm.

13.1 Business Case Report for the Potential Purchase by the Town of 10-14 Parker Street, Bassendean - Bassendean Fire Station (Ref: A4103 - Bob Jarvis, CEO)

APPLICATION

Council's consideration for the purchase of 10-14 Parker Street, Bassendean.

This matter was considered with members of the public excluded from the Chamber under Clause 5.23 (2) (c) and (d) of the Local Government Act 1995, as the Officer report discusses details of a proposed contract to be entered into.

OFFICER RECOMMENDATION – ITEM 13.1

That:

1. Council extends its appreciation to the Department of Fire and Emergency Service for the offer to purchase the Old Fire Station at 10-14 Parker Street, Bassendean; AND

2. Council advises the Department of Fire and Emergency Services that given the commitment by the local member, Mr Dave Kelly, MLA, now a Minister in the new Labor Government, to pursue the re-establishment of the Bassendean Fire Brigade at 10-14 Parker Street, Bassendean, Council declines the offer to purchase the property.

Cr Pule moved that Council defers the offer to purchase the property, pending the outcome of Minister Kelly's efforts.

COUNCIL RESOLUTION – ITEM 13.1

OCM – 25/04/17 MOVED Cr Pule, Seconded Cr Lewis, that:

1. Council extends its appreciation to the Department of Fire and Emergency Service for the offer to purchase the Old Fire Station at 10-14 Parker Street, Bassendean; AND

2. Council advises the Department of Fire and Emergency Services that given **the interest shown** by the local member, Mr Dave Kelly, MLA, now a Minister in the new Labor Government, to pursue the re-establishment of the Bassendean Fire Brigade at 10-14 Parker Street, Bassendean, **the Council defers** the offer to purchase the property, **pending the outcome of Minister Kelly's efforts.**

CARRIED UNANIMOUSLY 6/0

13.2 11 Hamilton Street, Bassendean (Ref: A2137 - Bob Jarvis, CEO & Graeme Haggart, Director Community Development

APPLICATION

Council's consideration of legal advice on the potential sale of 11 Hamilton Street, Bassendean, to the Casa Mia Montessori Community School Inc.

This matter was considered with members of the public excluded from the Chamber under Clause 5.23 (2) (c) and (d) of the Local Government Act 1995, as the Officer report discusses details of a proposed contract to be entered into.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION — ITEM 13.2

OCM – 26/04/17 MOVED Cr Pule, Seconded Cr Brown, that Council:

1. Requests the CEO to negotiate an agreement with the Board of the Casa Mia Montessori School for the potential sale of 11 Hamilton Street, Bassendean, to the School at market value, subject to:

   (a) The School agreeing to the Town lodging an absolute caveat over the title at the time of transfer to the School, and that the caveat prevents the School from on-selling the property or otherwise encumbering the title and facilitates the property's transfer back to the Town in the event the School is unable to acquire other contiguous properties, by an agreed date;

   (b) The Town being given power of attorney over the property to avoid there being any dispute at the re-transferring of the property back to the Town at the time of execution;

   (c) The caveat not permitting the School to mortgage the property or encumber it in any way;

2. The potential sale of 11 Hamilton Street, Bassendean, and conditions of the transaction be advertised for public comment prior to Council's final agreement to proceed with the sale; and

3. A draft of the legal documents for the sale, if negotiated, is presented to Council for approval (which will require an absolute majority) and endorsement for public advertising.

CARRIED UNANIMOUSLY 6/0

13.3 Appointment of Community Members to Vacant Positions on the Audit and Risk Management Committee and Liveable Town Advisory Committee (Ref: GOVN/CCLMEET/24 – CMT and Yvonne Zaffino, Council Support Officer)

APPLICATION

This report was for Council to consider nominations received to fill vacancies on the Audit and Risk Management Committee and the Liveable Town Advisory Committee for the 2015-17 term.

This report was discussed with members of the public excluded under Section 5.23 (2) (b) of the Local Government Act to maintain the confidentiality of the names of the nominees.

COUNCIL RESOLUTION/OFFICER RECOMMENDATION – ITEM 13.3

OCM – 27/04/17 MOVED Cr Bridges, Seconded Cr Lewis, that Council appoints the following as community members for the period expiring on the next ordinary Local Government Election Day in October 2017, unless otherwise indicated:

1. Tom Klaassen to the Audit and Risk Management Committee; and

2. David Doy and Ryan Medrana to the Liveable Town Advisory Committee.

CARRIED BY AN ABSOLUTE MAJORITY 6/0

COUNCIL RESOLUTION – ITEM 13.0(b)

OCM – 28/04/17 MOVED Cr Gangell, Seconded Cr Bridges, that the meeting proceed with open doors, the time being 9.30pm.

CARRIED UNANIMOUSLY 6/0

As no members of the public returned to the Chamber, the reading aloud of the motions passed behind closed doors was dispensed with.

14.0 CLOSURE

The next Ordinary Council Meeting will be held on Tuesday 23 May 2017.

There being no further business, the Presiding Member declared the meeting closed, the time being 9.30pm.

ATTACHMENT NO. 2

TOWN OF BASSENDEAN

MINUTES

SPECIAL COUNCIL MEETING

HELD IN THE COUNCIL CHAMBER, 48 OLD PERTH ROAD, BASSENDEAN

ON TUESDAY, 9 MAY 2017 AT 7.00PM

1.0 DECLARATION OF OPENING/ANNOUNCEMENT OF VISITORS

The Presiding Member declared the meeting open, welcomed all those in attendance and acknowledged the past and present traditional owners and custodians of the land on which the meeting was being held.

2.0 PUBLIC QUESTION TIME AND ADDRESS BY MEMBERS OF THE PUBLIC

Ms Nonie Jekabsons, 6 Barton Parade, Bassendean

Ms Jekabsons asked if the census information could be updated as the new information would be due in June 2017.

The CEO advised that this is the current information that is available.

Ms Jekabsons asked if all residents had received a copy of the community survey.

Mr Costarella advised that postcards were distributed to all residents in the Town, and also included paper copies available at the Customer Services Centre and Library.

Ms Kathryn Hamilton, 53 Broadway Street, Bassendean

Ms Hamilton asked if public comment would be sought on the adopted Strategic Community Plan.

Mr Costarella advised that the Plan would be advertised as an adopted plan of Council.

Ms Hamilton expressed her concern of the measures of success and asked that these be reviewed.

Ms Annie MacBeth, 27 Maley Street, Ashfield

Ms MacBeth also expressed her concern of the measures of success and asked that these be reviewed and include targets for each.

Ms Macbeth suggested that the Plan should include priorities to show the importance of each measure. Ms MacBeth also suggested that the Strategic Objectives should not be considered in a "silo" and that they would involve many sections of the Council services.

3.0 ATTENDANCES, APOLOGIES & APPLICATIONS FOR LEAVE OF ABSENCE

Present

Councillors

Cr John Gangell, Mayor
Cr Mike Lewis, Deputy Mayor
Cr Gerry Pule
Cr Paul Bridges
Cr Renee McLennan

Apologies

Cr Bob Brown
Mr Simon Stewert-Dawkins, Director Operational Services

Officers

Mr Bob Jarvis, Chief Executive Officer
Mr Michael Costarella, Director Corporate Services
Mr Graeme Haggart, Director Community Development
Mr Anthony Dowling, Director Strategic Planning

Public

Approximately 4 members of the public were in attendance.

Press

1 member of the press was in attendance.

4.0 REPORTS

4.1 2017-2027 Strategic Community Plan (Ref: CORM/POLCY/1- Bob Jarvis, CEO and the Corporate Management Team)

APPLICATION

The purpose of the report was for Council to adopt the 2017-2027 Strategic Community Plan following the community surveys and workshops as well as Councillor workshops held in March and April 2017.

OFFICER RECOMMENDATION – ITEM 4.1

That Council:

1. Adopts the 2017-2027 Strategic Community Plan, attached to the Ordinary Council Agenda of 26 April 2017; and

2. In accordance with Section 5.56 of Local Government Act and Administration Regulation 19D, give local, public notice of the adoption of the 2017-2027 Strategic Community Plan.

It was agreed to defer the matter to a workshop to allow further consideration of the document.

COUNCIL RESOLUTION – ITEM 4.1

SCM – 1/5/17 MOVED Cr Gangell, Seconded Cr Lewis, that the draft 2017-2027 Strategic Community Plan be deferred and further considered at a Councillors' Information Workshop to be held on 16 May 2017.

CARRIED 5/0

5.0 CLOSURE

There being no further business, the Presiding Member declared the meeting closed, the time being 7.12pm.

ATTACHMENT NO. 3

Australian Government

Australian Pesticides and Veterinary Medicines Authority

SEPTEMBER 2016

Regulatory position: consideration of the evidence for a formal reconsideration of glyphosate

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This publication is available from the APVMA website: www.apvma.gov.au.

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FOREWORD

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is an independent statutory authority with responsibility for the regulation of agricultural and veterinary chemicals in Australia. Its statutory powers are provided in the Agvet Codes scheduled to the *Agricultural and Veterinary Chemicals Code Act 1994*.

The APVMA has legislated powers to reconsider the approval of an active constituent, registration of a chemical product or approval of a label at any time after it has been registered. The reconsideration process is outlined in sections 29 to 34 of Part 2, Division 4 of the Agvet Codes.

A reconsideration may be initiated when new research or evidence raises concerns about the use or safety of a particular chemical, a product containing that chemical, or its label. The scope of each reconsideration can cover a range of areas including human health (toxicology, public health, occupational health and safety), the environment (environmental fate and ecotoxicology), residues and trade, chemistry, efficacy or target crop/animal safety. However, the scope of each reconsideration is determined on a case-by-case reflecting the specific issues raised by the new research or evidence.

The reconsideration process (illustrated in Figure 1) includes a call for information from a variety of sources, a review of that information and, following public consultation, a decision about the future use of the chemical or product. The information and technical data required by the APVMA to review the safety of both new and existing chemical products must be generated according to scientific principles. The APVMA conducts science and evidence-based risk analysis with respect to the matters of concern, analysing all the relevant information and data available.

When the APVMA receives or is made aware of a significant new piece of information that questions the safety (to target animals, humans or the environment) or efficacy of a registered chemical, the APVMA assesses the new information to determine whether a formal reconsideration of that chemical and/or products containing that chemical should be initiated.

In undertaking this process, the APVMA works in close cooperation with external experts including the Department of Health, Food Standards Australia New Zealand (FSANZ), the Department of the Environment and Energy and the state departments of agriculture, as well as other expert advisers as appropriate.

This document sets out the nomination assessment process for glyphosate that was initiated following the classification of glyphosate as 'probably carcinogenic to humans' by the International Agency for Research on Cancer (IARC) in March 2015.

This document and the technical reports relating to glyphosate are available from the APVMA website at www.apvma.gov.au. The technical reports are:

- Review of IARC Monograph 112 (Glyphosate): Tier 1
- Review of IARC Monograph 112 (Glyphosate): Tier 2.

1. Nomination	**Nomination.** Any person or group (including the APVMA and its partner agencies) may nominate an active constituent, product or label for reconsideration. The APVMA assesses the supporting scientific information and determines whether a reconsideration is warranted. Not all nominations will proceed to a formal reconsideration—there are other regulatory pathways available that may more efficiently address concerns. **The APVMA nominated glyphosate for reconsideration following the classification of glyphosate as 'probably carcinogenic to humans' by the International Agency for Research on Cancer in 2015.**	
2. Prioritisation	**Prioritisation.** The APVMA (with input from its advisory agencies) determines the priority of the reconsideration.	
3. Scoping and work plan	**Scope.** A scope document is prepared that outlines the areas of concern to be reconsidered. From 1 July 2015 the APVMA is legislatively required to publish a **work plan** for all reconsiderations to provide predictability about the timeframe for the reconsideration.	
4. Notice of reconsideration	**Notice of reconsideration.** To begin the reconsideration, the APVMA gives each holder a written Notice of Reconsideration that invites the holder to make a written submission to the APVMA. The holder is legally obliged to submit any available data relevant to the scope of the reconsideration. The APVMA supplements the submitted data with data available in the public domain (eg peer-reviewed scientific journal articles or international assessment reports).	
5. Assessment	**Toxicology assessment.** The toxicology assessment characterises all of the adverse health effects that a compound may cause and establishes health-based guidance values (also known as public health standards) for exposure to the chemical. The toxicology assessment recommends first aid directions, poisons scheduling and any necessary warnings for product labels.	**Environment risk assessment.** Where indicated in the scope of the reconsideration, an environmental risk assessment is conducted. The environmental risk assessment may include an evaluation of environmental fate and ecotoxicology.
	Human exposure assessment. The Toxicology assessment findings are used in the Occupational Health and Safety (human exposure) assessment. This assessment recommends safety directions, re-entry periods and restraints for all the uses supported by the assessment.	**Residues and dietary exposure risk assessment (includes trade).** The available residues data are used in the residues and dietary exposure risk assessment. This assessment recommends withholding periods, MRLs and restraints for all use patterns supported by this assessment. It also considers the potential trade risks arising from all the supported uses of products.
	Efficacy: If included in the scope of the review efficacy assessments are conducted by the APVMA.	

6. Draft regulatory measure	**Interim Regulatory Action.** At any time during a reconsideration, the APVMA may take regulatory action to mitigate any risks identified in relation to the use of a chemical. The aim of any such action is to protect human health or the environment (or both) while a final decision is being reached through the reconsideration process. **Proposed Regulatory Decision.** The APVMA considers all the assessments and develops draft recommendations for the reconsideration which summarise the results of the assessment, identified risks, risk mitigation measures, proposed review findings and draft regulatory decisions. The PRD and the component assessment reports are released for public consultation.
7. Consultation	**Consultation.** Further data or information may be submitted to the APVMA from a range of stakeholders including holders, users of the chemicals, peak industry bodies, interest groups, non-government organisations, state and territory governments or the public. Usually a 3-month public consultation period is conducted following publication of the PRD. Any further data or information submitted during consultation will be taken into consideration before making the final regulatory decision.
8. Regulatory decision	**Regulatory decision**. After the public consultation period has closed, the APVMA assesses all the comments received and amends the assessment, review findings and the proposed regulatory measures as necessary. We then make the final regulatory decision. There are three possible regulatory outcomes from a reconsideration: • affirm the approvals or registrations • vary the relevant particulars or conditions and affirm the approval or registration, or • suspend or cancel the approval or registration. The APVMA will affirm the approval or registration only if satisfied that it meets all statutory safety, efficacy, trade and labelling criteria and also complies with all requirements in the regulations If the active constituent, product or label does not meet the criteria as described above, the APVMA will examine whether the relevant particulars or conditions of the approval or registration can be varied so that the criteria can be met. This may include varying the instructions for use on the label. If product registrations or label approvals are cancelled the APVMA will examine whether a phase out period for dealing with or using cancelled products or products bearing cancelled labels is appropriate. Additional instructions may be applied during phase out. If a phase out period is not appropriate then recall action may be required.
END OF RECONSIDERATION (regulatory decision)	
9. Implementation	**Implementation.** Once the decision is made to affirm, cancel or vary conditions of registrations or approvals the APVMA will send written Notices to the holders of registrations and approvals and publish Notices of affirmation, variation of conditions, and cancellation of actives, products or label approvals. These Notices will include brief statements of the reasons for the actions, relevant particulars for any affirmed approvals or registrations and any appropriate instructions of use or phase-out periods for cancellations. The APVMA will publish details of any applicable phase out periods if any approvals of actives, registration of products or label approvals are cancelled. The maximum legislated phase out period is 12-months.

Figure 1: The chemical reconsideration process

SUBMISSIONS FROM THE PUBLIC ARE INVITED

This draft regulatory position report:

- outlines the APVMA chemical reconsideration process
- advises interested parties how to respond to the assessment
- summarises the nomination assessment methodology and outcomes
- outlines the proposed regulatory position to be taken in relation to the nomination for reconsideration of glyphosate and products containing glyphosate.

The APVMA invites persons and organisations to submit their comments and suggestions on this nomination assessment report directly to the APVMA. Comments on this report will be assessed by the APVMA before the report is finalised and the final regulatory position report is published.

Submissions can be sent to:

Director, Chemical Review
Australian Pesticides and Veterinary Medicines Authority
PO Box 6182

KINGSTON ACT 2604

Telephone: +61 2 6210 4749
Facsimile: +61 2 6210 4776
Email: chemicalreview@apvma.gov.au
Website: www.apvma.gov.au.

Preparing your comments for submission

Please limit any comments you have to the scientific justification for the proposed regulatory position on glyphosate.

When making your comments:

- clearly identify the issue and clearly state your point of view
- give reasons for your comments, supporting them with relevant scientific information and indicating the source of the information you have used.

Please try to structure your comments in point form, referring each point to the relevant section in the regulatory position report. This will help the APVMA assemble and analyse all of the comments it receives.

When making a submission, please include:

- contact name

- company name or group name
- postal address
- email address (if available)
- the date you made the submission.

Finally, tell us whether the APVMA can quote your comments in part or full.

Please note that, subject to the *Freedom of Information Act 1982*, the *Privacy Act 1988* and the Agvet Code, all submissions received may be made publicly available. They may be listed or referred to in any papers or reports prepared on this subject matter.

The APVMA reserves the right to reveal the identity of a respondent unless a request for anonymity accompanies the submission. If no request for anonymity is made, the respondent will be taken to have consented to the disclosure of their identity for the purposes of Information Privacy Principle 11 of the *Privacy Act 1988*.

The contents of any submission will not be treated as confidential or confidential commercial information unless they are marked as such and the respondent has provided justification for the material to be classified as confidential or confidential commercial information in accordance with the *Freedom of Information Act 1982* or the Agvet Code, as the case may be.

THE CLOSING DATE FOR SUBMISSIONS IS FRIDAY 30 DECEMBER 2016.

EXECUTIVE SUMMARY

Introduction

Glyphosate is a broad-spectrum, non-selective, post-emergent, systemic herbicide that kills or suppresses all plant types (except those genetically modified to be resistant to glyphosate) and is commonly used to control annual and perennial broadleaf and grassy weeds in various agricultural and non-agricultural settings. Glyphosate acts by disrupting the shikimic acid pathway, which is unique to plants, to prevent protein biosynthesis and kill the plant.

The first product containing glyphosate was registered for use in Australia in the 1970s, under the trade name 'Roundup®'. Products containing glyphosate that are registered for use in Australia are formulated as solutions, granules, aerosols and gels and are generally applied using ground or aerial equipment.

Concerns have recently been raised about human exposure to glyphosate, following an assessment by the International Agency for Research on Cancer (IARC) that re-classified glyphosate as 'probably carcinogenic to humans'.

The APVMA chose to consider glyphosate for reconsideration following the publication of the IARC Monograph 112 in July 2015. Once a chemical has been nominated for reconsideration, the APVMA examines the new information to determine whether there are sufficient scientific grounds to warrant placing the chemical under formal reconsideration. This regulatory position report represents the outcome of that scientific nomination assessment process.

Evaluation methodology: a weight-of-evidence approach

The nomination assessment process involved a scientific weight-of-evidence evaluation of information in the IARC monograph, risk assessments undertaken independently by regulatory agencies in other countries and expert international bodies, in addition to Adverse Experience Reports (AERs) submitted to the APVMA. A weight-of-evidence assessment involves an examination of the quality, biological relevance and consistency of studies, assessment reports and scientific conclusions according to the scientific method.

The APVMA commissioned a review of the IARC monograph by the Office of Chemical Safety (OCS) within the Department of Health. This review was conducted in two phases: Tier 1 involved conducting a preliminary scoping review of the IARC monograph to ascertain the relevance of the carcinogenicity classification of glyphosate and any implications that this may have for glyphosate approvals and registrations in Australia; Tier 2 involved conducting a detailed assessment of those studies that were identified during the Tier 1 assessment as requiring further evaluation.

The APVMA also reviewed a number of very recent international assessments of glyphosate including those undertaken by the Joint Food and Agriculture Organisation of the United Nations/World Health Organisation (FAO/WHO) Meeting on Pesticide Residues, the European Food Safety Authority (EFSA), the European Chemicals Agency (ECHA), Health Canada and the New Zealand Environmental Protection Authority (NZ EPA).

Assessment of the IARC glyphosate monograph

The OCS undertook a screening level assessment of the IARC monograph (Tier 1) and identified 19 references relevant to the carcinogenicity classification of glyphosate requiring a more in-depth evaluation, with an additional 74 references requiring further review to determine their relevance—the APVMA utilised recent independent international assessments of these references. Following the assessment of the 19 studies relevant to the IARC carcinogenicity classification of glyphosate (Tier 2), the OCS concluded that there did not appear to be any new information to indicate that glyphosate poses a carcinogenic or genotoxic risk to humans.

Evaluation of international assessments of glyphosate

The JMPR, EFSA, ECHA and Health Canada assessments of glyphosate all evaluated the publicly available data that was considered in the IARC monograph, as well as other published and unpublished data not available to IARC. In addition, the NZ EPA assessed the publicly available data contained in the IARC monograph and assessments by JMPR and EFSA.

Carcinogenicity studies in laboratory animals: EFSA concluded that the weight-of-evidence is that there is no carcinogenic risk to humans related to the use of glyphosate. JMPR concluded that glyphosate is not carcinogenic in rats but was unable to exclude the possibility that glyphosate is carcinogenic in mice at very high doses. The assessment conducted by ECHA concluded that there was no evidence of carcinogenicity in mice or rats due to a lack of statistical significance in pair-wise comparisons, a lack of consistency across studies, that slightly increased tumour incidences were only evident at doses exceeding the maximum tolerated dose, the absence of early cellular changes or pre-neoplastic lesions and/or incidences that tumour incidences were in the range of normal biological variation. Health Canada concluded that there was no evidence that glyphosate was carcinogenic or genotoxic in rats but that there was some evidence for a marginal increase in the incidence of ovarian tumours in mice only at the highest tested dose—however, these results were considered to be of low concern for human health risk assessment. The assessment commissioned by the NZ EPA concluded that long-term carcinogenicity studies produced consistently negative results and that the IARC assessment attributed inappropriate weight to the studies included in its assessment, which did not demonstrate a dose-response relationship, reported only minor positive results at the maximum dose tested, did not to consider relevant historical control data and excluded some studies that did not report positive associations between glyphosate exposure and carcinogenicity.

Genotoxicity studies: JMPR concluded that the overall weight-of-evidence is that glyphosate is unlikely to be genotoxic to humans at anticipated dietary exposures. EFSA, ECHA, Health Canada and the NZ EPA similarly concluded that the weight-of-evidence does not support the hypothesis that glyphosate is genotoxic. Again, these assessments concluded that the evidence presented by IARC as representative of strong evidence for genotoxicity and oxidative stress was primarily based on exposure scenarios not relevant to humans.

Epidemiological studies: ECHA concluded that the value of the human data for hazard classification purposes is questionable and limited because it is difficult to distinguish between the effects of the active constituent and co-formulants, as humans are never exposed to the active constituent alone, and humans are exposed to a many environmental chemicals, making it difficult to attribute health effects to one specific chemical. The JMPR, EFSA, ECHA and NZ EPA assessments concluded that while there was some evidence of a positive statistical association between glyphosate exposure and the risk of non-Hodgkin's lymphoma (NHL) in some retrospective

case-control studies, the one large, high-quality prospective cohort study found no statistical association at any exposure level. The EFSA assessment further noted that it was not possible to differentiate between the effects of glyphosate and the co-formulants in the epidemiological data available. The ECHA assessment describes a number of papers that did not identify a risk between glyphosate exposure and various specific cancer types, including NHL, lymphomas in general or multiple myeloma. The ECHA concluded that a comprehensive review of epidemiological studies assessing the possible association between glyphosate exposure and cancer found no consistent pattern of positive associations that would suggest a causal relationship between glyphosate exposure and the development of cancer in adults or children. The ECHA further concluded that, while epidemiological data is of limited value for detecting the carcinogenic potential of a pesticide, the data do not provide convincing evidence for an association between glyphosate exposure in humans and any cancer type. The Health Canada assessment concluded that the majority of epidemiological data considered by IARC lacked adequate characterisation of glyphosate exposure and that as a result these studies were of limited use for supplementing the hazard assessment of glyphosate.

Assessment of adverse experience reports (AER)

Between 1996 and 2013, a total of four AERs relating to human safety were submitted to the APVMA's Adverse Experience Reporting Program (AERP). All were classified as 'possible' or 'probable' by the APVMA. Of the four reports, one was of skin irritation while the remaining three were reports of eye irritation. The APVMA is confident that the current safety and use directions included on approved labels for products containing glyphosate are sufficient to mitigate these known adverse effects.

Proposed regulatory position

Based on this nomination assessment, the APVMA concludes that the scientific weight-of-evidence indicates that:

- exposure to glyphosate does not pose a carcinogenic or genotoxic risk to humans
- there is no scientific basis for revising the APVMA's satisfaction that glyphosate or products containing glyphosate:
  - would not be an undue hazard to the safety of people exposed to it during its handling or people using anything containing its residues
  - would not be likely to have an effect that is harmful to human beings
  - would not be likely to have an unintended effect that is harmful to animals, plants or things or to the environment
  - would be effective according to criteria determined by the APVMA by legislative instrument, and
  - would not unduly prejudice trade or commerce between Australia and places outside Australia.
- **there are no scientific grounds for placing glyphosate and products containing glyphosate under formal reconsideration**
- the APVMA will continue to maintain a close focus on any new assessment reports or studies that indicate that this position should be revised.

1 INTRODUCTION

Glyphosate [*N*-(phosphonomethyl)glycine) is an aminophosphonic analogue of glycine, which is a naturally occurring amino acid. Glyphosate is classified as an organophosphate as it contains carbon and phosphorous; however, it does not affect the nervous system the way other organophosphates do. Glyphosate is a broad-spectrum, non-selective, post-emergent, systemic herbicide that kills or suppresses all plant types, except those that have been genetically modified to be resistant to glyphosate, and can be used as a plant-growth regulator/desiccator at lower dose rates. Herbicide products that contain glyphosate are commonly used to control annual and perennial broadleaf and grassy weeds in various agricultural and non-agricultural settings. Glyphosate binds strongly to soil particles and is readily metabolised by soil microorganisms, therefore when applied post-emergence, glyphosate demonstrates no pre-emergence or residual activity.

The water solubility of technical-grade glyphosate acid can be increased by formulating it primarily as its isopropylamine salt, or less commonly as monoammonium, potassium, trimesium, monoethanolamine or dimethylammonium salts, or various combinations of those salts. Furthermore, commercial formulated products contain various non-ionic surfactants to facilitate uptake by plants. Some commercial formulations also contain other active constituents in an attempt to mitigate herbicide resistance.

Glyphosate is taken up by the leaves and other green parts of the plant and translocated to the entire plant systemically. As a result, glyphosate is capable of total destruction of the plant. Glyphosate binds to and blocks the enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS), thereby disrupting the shikimic acid pathway and preventing the plant from synthesising the essential aromatic amino acids required for protein biosynthesis (phenylalanine, tyrosine and tryptophan), killing the plant. As this pathway is unique to plants and therefore is not present in mammals, glyphosate demonstrates low vertebrate toxicity.

The first product containing glyphosate was registered for use in Australia in the 1970s, under the trade name 'Roundup'. Products containing glyphosate that are registered for use in Australia are formulated as solutions, granules, aerosols and gels (Table 1) and can be applied using ground or aerial equipment, as well as some specialised application methods (eg aerosol).

1.1 Current regulatory status of glyphosate in Australia

As of February 2016 there were 80 active constituent approvals for glyphosate and 471 registered products containing glyphosate. Of the 471 registered products, 130 are for home garden use and 370 are for commercial/agricultural use (Table 1). In these registered products, glyphosate is present at varying concentrations and is formulated in various salt forms, including ammonium, dimethylammonium, isopropylamine, mono-ammonium, monoethanolamine and potassium salts. Some registered products contain additional active constituents, including amitrole, ammonium thiocynate, butafenacil, carfentrazone-ethyl, diflufenican, imazapyr and oxyfluorfen.

Glyphosate is approved for use in Australia to control various annual and perennial broadleaf, grassy and woody weeds, trees and brush and is used in a variety of different situations, such as:

- croplands for the control of emerged weeds prior to crop and fallow establishment, minimum tillage farming, direct drilling into seedbed, for pre-harvest desiccation

- non-cultivated land (eg industrial, commercial, domestic and public service areas) and rights of way
- forests, orchards, vines and plantations
- home garden use on rockeries, garden beds, driveways, fence lines, firebreaks, around buildings and prior to planting new lawns and gardens
- aquatic areas (restricted to dry drains and channels, dry margins or dams, lakes and streams)
- aquatic weed control and control of weeds on margins of dams, lakes and streams or in channels, drains or irrigation (selected products only).

Glyphosate is applied by ground boom, knapsack/handgun, gas/splatter gun, wiper equipment, controlled droplet application equipment, aerial spraying, aerosol spray, ready to use spray bottle and ready to use gel dispenser.

Table 1: Formulation types for glyphosate products

Formulation type	Level of active constituent	Product type
Aqueous concentrate	3.6 g/L	Home garden
	7.2 g/L	Home garden
	60 g/L	Commercial
	100 g/L	Home garden
	150 g/L	Commercial
	300 g/L	Commercial
	360 g/L	Home garden and commercial
	450 g/L	Home garden and commercial
	470 g/L	Commercial
	480 g/L	Commercial
	490 g/L	Home garden and commercial
	500 g/L	Home garden and commercial
	510 g/L	Commercial
	540 g/L	Home garden and commercial
Soluble concentrate	7.2 g/L	Home garden
	15.2 g/L	Home garden
	143 g/L	Home garden
	150 g/L	Commercial

Formulation type	Level of active constituent	Product type
	360 g/L	Home garden and commercial
	450 g/L	Commercial
	470 g/L	Commercial
	480 g/L	Commercial
	490 g/L	Home garden
	495 g/L	Commercial
	500 g/L	Commercial
	510 g/L	Commercial
	517 g/L	Commercial
	535 g/L	Commercial
	540 g/L	Home garden and commercial
	570 g/L	Commercial
	600 g/L	Commercial
Emulsifiable concentrate	360 g/L	Commercial
Suspension concentrate	225 g/L	Home garden and commercial
	360 g/L	Home garden and commercial
	450 g/L	Commercial
	510 g/L	Commercial
	600 g/L	Commercial
	700 g/L	Commercial
Water dispersible granule	680 g/kg	Home garden and commercial
	690 g/kg	Commercial
	700 g/kg	Commercial
	835 g/kg	Commercial
Water soluble granule	680 g/kg	Commercial
	700 g/kg	Commercial
	720 g/kg	Commercial

Formulation type	Level of active constituent	Product type
	800 g/kg	Commercial
	840 g/kg	Commercial
	900 g/kg	Commercial
	875 g/kg	Commercial
Aerosol	10 g/kg	Home garden
Liquid	7.2 g/L	Home garden
	360 g/L	Home garden and commercial
	450 g/L	Commercial
Liquid concentrate	570 g/L	Commercial
Emulsion, oil in water	4.8 g/L	Home garden
	25.6 g/L	Home garden
	432 g/L	Commercial
Gel	7.2 g/L	Home garden
	40 g/L	Home garden
Dry flowable	225 g/L	Home garden
Other liquids to be applied undiluted	7.2 g/L	Home garden
	7.4 g/L	Home garden
	16 g/L	Home garden

Previous reconsideration of glyphosate by the APVMA in 1996

A formal reconsideration of glyphosate was initiated following concern by the then Commonwealth Environment Protection Agency that certain surfactants in glyphosate formulations were acutely toxic to tadpoles at concentrations that are likely to occur in shallow water when products were used according to approved label instructions. Seventy five products were placed under review and all 27 holders were invited to provide information to the APVMA (then the National Registration Authority; NRA) relating to the review.

The scope of the review was limited to:

- reviewing application methods of glyphosate formulations adjacent to aquatic environments of all registered agricultural products

- a proposal to include a warning statement on all agricultural glyphosate product labels precluding use on or adjacent to waterways unless otherwise authorised
- a proposal to only allow use of glyphosate formulations in sensitive aquatic situations where it can be demonstrated that there is no significant risk to the aquatic environment.

The conclusions of the reconsideration were that the aquatic toxicity of registered glyphosate formulations was undesirably high and was mainly due to the surfactants in the formulations. Therefore, a number of conditions of registration were modified to describe more clearly the situations in which products registered for use in aquatic situations could be used to avoid the risk of significant aquatic contamination. Use of the formulated products was restricted to dry drains and channels and dry margins of dams, lakes and streams. Warning statements on labels were amended to minimise any possible aquatic contamination. Only formulations with an acceptable margin of aquatic safety would be registered for controlling weeds growing in or over water. Holders were provided 12 months (until 30 June 1997) to make the necessary changes to their products. No changes were made to products registered solely for home garden use, as the risk of significant aquatic contamination was considered very low. The final reconsideration report is available on the APVMA website.

Response to claims that glyphosate is responsible for causing birth defects

In June 2011, Earth Open Source (EOS) published a document titled 'Roundup and birth defects: is the public being kept in the dark?' In this document, EOS questioned the safety of glyphosate and products that contain it. The claims made by EOS were:

- exposure to concentrations of glyphosate lower than those commonly used in agriculture and the home garden have been linked to developmental malformations affecting the skull, face, brain and spinal cord in frog and chicken embryos
- a range of developmental malformations, as well as endocrine disruption and reproductive toxicity have been observed in humans and experimental animals following exposure to glyphosate
- a variety of *in vitro* test systems have demonstrated that glyphosate can induce damage to DNA and genetic material in laboratory animals and humans
- glyphosate exposure has been linked to cancer of the testis in rats, skin cancer in mice and blood system cancers in humans
- glyphosate exposure has been linked to neurotoxicity and the development of Parkinson's disease in humans.

The APVMA commissioned an expert review of that document, which was published in July 2013, to address the concerns raised in the EOS article. In doing so, the APVMA evaluated both the published studies cited in the EOS document and other more recent publications and archived toxicology studies of glyphosate, compared the EU reviews of glyphosate with reviews prepared by other regulators, assessed the scientific merit of the claims made by EOS and the research upon which those claims were based and considered whether there were implications for the registration of products containing glyphosate in Australia. The full review of the EOS document can be found on the APVMA archive website.

A number of conclusions were made in the review of the EOS document. These included:

- The available data do not indicate that glyphosate products registered for use in Australia and used according to label instructions present any unacceptable risks to human health, the environment or trade.
- The weight- and strength-of-evidence demonstrate that glyphosate is not genotoxic, carcinogenic or neurotoxic.
- Developmental malformations caused by glyphosate in toad and chicken embryos are not predictive of a developmental hazard to humans because of the routes of administration used. Some studies have reported fetal skeletal abnormalities, toxicity to the male reproductive tract during puberty and interference with the maturation of the male reproductive organs during puberty; however, these studies were affected by flawed design, methodology and/or reporting and the claimed effects on puberty are inconsistent.
- Glyphosate is extremely unlikely to cause reproductive or developmental toxicity in humans under normal conditions of exposure.
- At present, there is no scientific justification for classifying glyphosate as an endocrine disrupter.
- Effects on hormonal regulation and cellular toxicity observed *in vitro* may have been confounded by surfactants present in formulated products.
- Most studies utilising formulated products containing glyphosate have not identified which chemical constituent was responsible for causing the reported effects, or characterised their mode of action.
- The toxicological studies cited by EOS do not demonstrate a need to revise the current Australian Acceptable Daily Intake (ADI) of 0.3 mg/kg bw/day for glyphosate.
- New information that emerges from the United States (US) and Canadian reviews of glyphosate will be considered by the APVMA.

The Poisons Standard (SUSMP)

The Poisons Standard, or the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) controls how medicines and poisons are made available to the public and classifies them into Schedules according to the level of regulatory control that is required in order to maintain public health and safety. Scheduling of medicines and poisons in Australia is a legislative requirement administered by the Therapeutic Goods Administration (TGA). However, the scheduling controls are implemented through State and Territory legislation, therefore the implementation of any restrictions imposed by the TGA may differ between States and Territories. Model provisions about packaging and labels, a list of products recommended to be exempt from the provisions and recommendations about other relevant controls are also included.

When making a scheduling decision, various criteria are considered, including toxicity, purpose of use, potential for abuse, safety in use and the need for the substance. Medicines and poisons are classified in one of ten Schedules. Agricultural, domestic and industrial poisons are generally listed in Schedules 5 (caution), 6 (poison) or 7 (dangerous poison), which represent increasingly stricter container and labelling requirements. Products for domestic use must not be listed in Schedule 7.

Glyphosate is classified as a Schedule 5 (caution) substance, which is defined as a substance with a 'low potential for causing harm, the extent of which can be reduced through the use of appropriate packaging with strong warnings and safety directions on the label'. To classify as a Schedule 5 poison, the substance must adhere to the following criteria:

- the substance is non-corrosive and has a low toxicity
  - acute oral toxicity (rat): 2000 mg/kg to 5000 mg/kg
  - acute dermal LD_{50}: > 2000 mg/kg
  - acute inhalation LC_{50} (rat): > 3000 mg/m^3 (4 hours)
- the substance has a low health hazard from repeated use and is unlikely to result in irreversible toxicity
  - no other significant toxicity (eg carcinogenicity, mutagenicity, etc)
- the substance is capable of causing only minor adverse effects to humans in normal use
  - specialised personal protective equipment should not be necessary for safe use
- the likelihood of injury during handling, storage and use can be mitigated through appropriate packaging and label warnings
- the substance has a low potential for causing harm
  - potential harm is reduced through the use of appropriate packaging with simple warnings and safety directions on the label.

1.2 Health-based guidance values for glyphosate

Health-based guidance values are established by regulatory authorities (and international bodies such as the JMPR) for the purpose of determining whether human exposure (via the diet or occupationally) to a particular chemical is safe. Health-based guidance values provide quantitative information to risk managers to enable them to make informed, scientific decisions related to protecting human health.

Acceptable Daily Intake (ADI)

The ADI is the amount of a chemical that can be ingested daily over a lifetime without any appreciable risk to health. The ADI is based on the lowest NOAEL (No Observed Adverse Effect Level) for the most sensitive adverse effect relevant to humans.

The ADI for glyphosate in Australia is 0.3 mg/kg bw/day based on the No-Observed-Adverse-Effect Level (NOAEL) of 30 mg/kg bw/day (the highest tested dose) in a 3-generation reproduction dietary study in rats and using a 100-fold safety factor to account for extrapolation from animals to humans as well as variation in sensitivity within the human population.

Acute Reference Dose (ARfD)

The ARfD is an estimate of the amount of a substance in food and drinking water, expressed on a milligram per kilogram bodyweight basis, which can be ingested in a period of 24 hours or less without appreciable health risk to the consumer. In 1998, JMPR concluded that an ARfD must be determined for all pesticides, unless the toxicological profile indicated that the pesticide was unlikely to present an acute hazard. As the toxicology assessments of glyphosate indicate that there is no likelihood of glyphosate presenting an acute hazard to human health, an ARfD has not been established for glyphosate in Australia or overseas.

Maximum Residue Limits (MRL) and National Residue Survey (NRS)

The maximum amount of a chemical that is legally permitted in a food is known as the MRL. The MRL is based on good agricultural and chemical use practices to ensure that an agricultural or veterinary chemical has been used according to the directions on the approved label. The MRL is set well below the level that would result in the health-based guidance values being exceeded if the chemical is used according to the approved label instructions. Therefore, while exceedance of the MRL may indicate a misuse of the chemical, it does not normally indicate that there is a public health or safety concern. The APVMA sets MRLs for agricultural and veterinary chemicals in agricultural produce. The states and territories are responsible for enforcing MRLs.

The *Agricultural and Veterinary Chemicals Code Instrument No. 4 2012* (MRL Standard) lists MRLs for chemicals that may arise from the approved use of products containing that chemical, and outlines the definitions of those residues. The glyphosate residue definition is the sum of glyphosate, *N*-acetyl-glyphosate and aminomethyphosphonic acid (AMPA) metabolite, expressed as glyphosate.

As a part of the Department of Agriculture and Water Resources strategy to minimise chemical residues in agricultural product, the NRS facilitates testing of animal and plant products for pesticide and veterinary medicine residues, and environmental contaminants. In the 2013–14 NRS report, glyphosate residues greater than half of the MRL were not detected in any samples of barley, canola, chickpea, faba bean, field pea, lentil, lupin, maize, sorghum, triticale, wheat, wheat durum or macadamias. In 1/28 samples of oats, glyphosate residues above the MRL were detected (NRS 2014b), while in 1/37 almond samples, glyphosate residues lower than the MRL were detected (NRS 2014a). In the 2014–15 report (not yet published), glyphosate residues above the MRL were reported in 1/42 oat samples and residues below the MRL (above half of the MRL) were reported in 4/42 oat samples (NRS 2015). No residues greater than half of the MRL were detected in any samples of barley, chickpea, faba bean, canola, cowpea, field pea, lentil, maize, lupin, maize, mung bean, sorghum or wheat.

Australian Total Diet Study (ATDS)

The ATDS is coordinated by FSANZ to monitor Australia's food supply and ensure that food regulatory measures are protecting consumer health and safety. The ATDS assesses dietary exposure to pesticide residues, contaminants and other substances and is conducted approximately every two years.

The 23rd ATDS examined dietary exposure to 214 agricultural and veterinary chemicals, nine contaminants, 12 mycotoxins and 11 nutrients in 92 commonly consumed foods and beverages in 2008 (FSANZ 2011a). Glyphosate residues were detected in 2/12 samples of multigrain bread (mean concentration 0.016 mg/kg) (FSANZ 2011b). Based on these results, FSANZ estimated the mean consumer dietary exposure to glyphosate as 0.12, 0.81, 0.87, 0.97 and 1.4 µg/day in children aged 9 months, 2–5 years, 6–12 years and 13–16 years and adults aged 17 years and above, respectively (FSANZ 2011b). These estimated exposures are well below (214–25 000 times) the ADI of 0.3 mg/kg indicating that there are no safety concerns for Australian and New Zealand consumers.

Drinking water standards

The Australian Drinking Water Guidelines (the Guidelines) are a joint publication of the National Health and Medical Research Council (NHMRC) and the Agricultural and Resource Management Council of Australia and New Zealand. The Guidelines are not legally enforceable but provide a standard for water authorities and state health authorities to ensure the quality and safety of Australia's drinking water.

The health-related guideline value (expressed as mg/L) is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHMRC 2011). Health values are derived so as to limit intake from water alone to approximately 10% of the ADI, on the assumption that (based on current knowledge) there will be no significant risk to health for an adult having a daily water consumption of 2 litres over a lifetime. The current health-related guideline value for glyphosate in drinking water is 1 mg/L—excursions above this value would need to occur over a significant period of time to be of a health concern (NHMRC 2011). Glyphosate is generally not reported in the analysis of Australian waters and is unlikely to be found at levels that may cause health concerns.

1.3 Legislative basis for a reconsideration of glyphosate

The basis for a reconsideration of the registration and approvals for a chemical is whether the APVMA is satisfied that the safety, efficacy and trade criteria listed in sections 5A, 5B and 5C of the Agvet Code for continued registration and approval are being met. These requirements are that the use of the product, in accordance with instructions approved, or to be approved, by the APVMA for the product or contained in an established standard:

- would not be an undue hazard to the safety of people exposed to it during its handling or people using anything containing its residues
- would not be likely to have an effect that is harmful to human beings
- would not be likely to have an unintended effect that is harmful to animals, plants or things or to the environment
- would be effective according to criteria determined by the APVMA by legislative instrument, and
- would not unduly prejudice trade or commerce between Australia and places outside Australia.

The APVMA may also consider whether labels for containers for chemical products containing glyphosate meet the labelling criteria as defined in section 5D of the Agvet Code which requires that labels have adequate instructions relating to:

- the circumstances in which the product should be used
- how the product should be used
- the times when the product should be used
- the frequency of the use of the product
- the re-entry period after use of the product
- the withholding period after the use of the product
- disposal of the product and its container
- safe handling of the product and first aid in the event of an accident
- any matters prescribed by the regulations.

2 INTERNATIONAL REGULATORY STATUS

Glyphosate is approved for use throughout the world, including in Europe and the United Kingdom (UK), the US, Canada, Australia, New Zealand, China, Brazil etc.

2.1 United States

The United States Environmental Protection Agency (US EPA) registers pesticides under the Federal Insecticide, Fungicide and Rodenticide Act and periodically (at least every 15 years) re-evaluates pesticides to ensure that they continue to meet registration standards, noting that new scientific information may be generated that should be taken into consideration. The registration of glyphosate is currently being reviewed as a part of this process. The re-assessment began in 2009 and was originally scheduled for completion in 2015; however, finalisation of the assessment was delayed following the re-classification of glyphosate by IARC. The final report is currently expected to be completed and published in 2016. The US EPA utilises a risk assessment process for evaluating the potential for health and ecological effects of a pesticide. The human health risk assessment process utilises the National Research Council's process for human health risk assessments, which is the procedure outlined by the International Programme on Chemical Safety (IPCS) and adopted by JMPR, as described in Section 4.3. In addition, the US EPA has developed a framework to incorporate epidemiological information into its risk assessment, which is based on peer-reviewed, robust principles and tools. The framework methodology was reviewed in 2010 by the Federal Insecticide, Fungicide and Rodenticide Act Scientific Advisory Panel. Chemicals are assessed for carcinogenicity using the US EPA's Guidelines for Carcinogen Risk Assessment (2005).

In February 2016, the US Food and Drug Administration (US FDA) announced that they would begin testing for residues of glyphosate on various foods, including soybeans, corn, milk and eggs. Concurrently, the US Fish and Wildlife Service announced that they would commence an analysis in conjunction with the US EPA of the impacts of four commonly used pesticides (including glyphosate) on 1500 endangered species, which is due for completion by December 2022.

Glyphosate-based formulations are currently registered in the US to control weeds in various fruit, vegetable and other food crops, glyphosate-resistant transgenic crops, ornamental plantings, lawns and turf, greenhouses, aquatic areas, forest plantings and roadside rights of way. Products registered in the US that contain glyphosate are formulated as liquids, solids and ready-to-use formulations, and can be applied using ground and aerial equipment as well as small hand-held sprayers.

2.2 Canada

The registration of pesticides in Canada is regulated by Health Canada's Pest Management Regulatory Agency (PMRA). In 2010 Health Canada's PMRA commenced a re-evaluation of glyphosate in collaboration with the US EPA's re-evaluation of glyphosate. In April 2015, the PMRA published its Proposed Re-evaluation Decision (PRVD2015-01) for glyphosate. In that document, the PMRA proposed continued registration of products containing glyphosate for sale and use in Canada. However, as a condition of the proposed continued registration, new risk reduction measures were proposed for end-use products, aimed at protecting both human health and the environment (Table 2).

Table 2: New measures to minimise risk of glyphosate exposure proposed by Health Canada's Pest Management Regulatory Agency

Human health	Environment
A restricted-entry interval of 12 hours for agricultural uses to protect workers	Environmental hazard statements to inform users of toxicity to non-target species
Apply only when potential for drift to areas of human habitation or activity (eg houses, cottages, schools and recreational areas) is minimal, to protect bystanders	Spray buffer zones to protect non-target terrestrial and aquatic habitats
	Precautionary statements for sites with characteristics that may be conducive to runoff and when heavy rain is forecast are proposed to reduce potential for runoff to adjacent aquatic habitats
	A vegetative strip between treatment area and edge of a water body to reduce runoff to aquatic areas

Following the publication of the proposed re-evaluation decision, the PMRA accepted written comments on the report for 60 days from the date of publication. The PMRA will consider all submissions prior to making a final, scientific decision on the registration of glyphosate in Canada.

2.3 Europe and the United Kingdom

All active constituents used in pesticide products in the EU are subject to approval by the European Commission (EC). However, individual Member States are responsible for authorising the final formulated pesticide products containing those active constituents in its territory. Therefore, whilst a chemical may be registered for use in the EU, Member States have the power to restrict use of that product in its territory. The EC approval is limited to a maximum of ten years—therefore, if manufacturers wish to continue using that active constituent in pesticide products, they must apply for renewed approval prior to the end of these ten years. The EC appoints a member state to act as the Rapporteur Member State (RMS) to conduct the assessment of a chemical.

The European Food Safety Authority (EFSA) is an agency that is funded by the EU but operates independently of the European legislation and member states. Legally established in 2002 by the EU, EFSA provides scientific advice and communication on risks associated with the food chain in Europe and is responsible for risk assessment of available science, but is not involved in legislative risk management or policy determination. Instead, the risk assessment conducted by EFSA is used to inform European policy and legislation by the EU risk managers, including the EC and the European Parliament (EP).

Glyphosate is registered for use throughout Europe and the UK and in August 2014 was subjected to a re-assessment by the RMS, Germany, as mandated by the EC and coordinated by EFSA. The Federal Republic of Germany was appointed as the RMS to conduct the assessment. The Federal Office of Consumer Protection and Food Safety was appointed by the German government as the lead authority for drafting the Renewal Assessment Rapport (RAR). The Federal Institute for Risk Assessment (BfR) was subsequently commissioned to assess the potential health risks of glyphosate. Once completed, the draft report was presented to EFSA and a consultation

period commenced. All comments and additional data resulting from the consultation period was incorporated into the draft, which was then submitted to EFSA in December 2014.

In February 2015, the BfR prepared a revised health risk assessment report on glyphosate, which was subsequently revised in April 2015 to include additional evaluation tables and clarify some factual information following consultation with EFSA. The assessment by EFSA was published in November 2015. The report concluded that glyphosate was 'unlikely to pose a carcinogenic hazard to humans and the evidence does not support classification with regard to its carcinogenic potential' (EFSA 2015).

In April 2015, the EC provided EFSA with a second mandate, to consider the findings of the IARC regarding the potential carcinogenicity of glyphosate or products containing glyphosate in the original assessment. In July 2015, the German government and EFSA commissioned BfR to review the IARC monograph on the re-classification of glyphosate. The review was completed in August 2015 as an addendum to the original RAR and was peer reviewed by EFSA. A detailed discussion of the BfR's review of the IARC monograph is provided below in Section 4.4).

Briefly, the BfR agreed with IARC's conclusion that there is 'limited evidence in humans for the carcinogenicity of glyphosate' but noted that no consistent positive association between glyphosate exposure and the development of cancer was demonstrated, and the most powerful study reported no effect. The BfR disagreed with IARC's conclusion that there is 'sufficient evidence in animals for the carcinogenicity of glyphosate', concluding that the weight-of-evidence suggests that there is no carcinogenic risk related to the use of glyphosate and that no hazard classification for carcinogenicity is warranted according to the Classification, Labelling and Packaging of Substances and Mixtures (CLP criteria) (Germany 2015). The BfR also disagreed with IARC's conclusion that there 'is mechanistic evidence for genotoxicity, oxidative stress, inflammation, immunosuppression, receptor-mediated effects, and cell proliferation or death of glyphosate' and concluded that the mechanistic and other studies do not provide evidence for a carcinogenic mechanism. The BfR concluded that the weight-of-evidence suggests that neither glyphosate nor AMPA (a metabolite of glyphosate) induce mutations *in vivo* and that no hazard classification for mutagenicity was warranted according to CLP criteria (Germany 2015).

The initial registration of glyphosate was scheduled to expire on 31 December 2015 (EC 2015). Following an expert meeting of EFSA, the EU member states, WHO, IARC and the US EPA, and in consideration of the revised RAR and addendum, EFSA completed its report for the assessment of glyphosate for the purpose of renewed approval and recommended that a renewal of the registration of glyphosate be granted. The EFSA RAR and addendum were subject to a thorough peer review by the competent authorities of the EU Member States and to accommodate that peer review process, the registration of glyphosate was provisionally extended until 30 June 2016. All but one of the Member States experts agreed that glyphosate is unlikely to be genotoxic or pose a carcinogenic risk to humans. The EC postponed a vote by EU member states to renew approval of glyphosate, which was originally scheduled for the meeting on 7 and 8 March 2016 of the EU Standing Committee on Plants, Animals, Food and Feed (hereafter referred to as the Standing Committee) until after the European Parliament vote in April 2016.

In March 2016, the EU Environment Committee Members of the European Parliament (MEPs) voted in favour of a resolution for the EC to abandon its proposal to renew approval of glyphosate in the EU for a further 15 years with no restrictions. The Environment MEPs instead requested that the EC conduct an independent review and disclose all of the scientific evidence used by EFSA in its assessment of glyphosate. They added that the EU Food and Veterinary Office should also be mandated to test and monitor glyphosate residues in food and drink.

The resolution was put to a vote at the plenary session of the EP scheduled for 11–14 April in Strasbourg, which again resulted in a postponement of the vote to re-register glyphosate, as a qualified majority consensus could not be reached. The Standing Committee again met on 18–19 May 2016 to discuss a 10 year re-registration for glyphosate in the EU. Again, the vote was postponed because a qualified majority was not reached. On 2 June 2016, the EC announced a proposal for the Standing Committee to meet on 6 June 2016 to consider a 2-year extension to the current registration of glyphosate so that the ECHA could complete an assessment of the carcinogenicity and potential for endocrine disruption of glyphosate. The EC also proposed banning polyethoxylated tallow amines (POEA; in glyphosate-based formulations only), minimising the use of glyphosate in public parks, playgrounds and gardens, and minimising pre-harvest use of glyphosate. In order for the proposal to pass, 55% of Member States (representing 65% of the EU's population) would be required to vote in favour. Of the 28 Member States, 20 voted in favour of the proposal, 7 abstained (did not vote for or against) and 1 (Malta) voted against the proposal. As a result of the relatively large populations of some of the countries that abstained from voting, the favourable votes accounted for only 52.91% of the EU's population and the proposal did not pass.

On 24 June 2016, the EC convened an Appeals Committee to consider the re-approval of glyphosate for 18 months to allow the ECHA to gather additional data and undertake a comprehensive analysis of the health risks association with its use. Again, a qualified majority position was not reached, with 19 countries in favour of the extended approval, two against (France and Malta) and seven abstaining, representing 51.49% of the EU's population in favour of the extension.

When a qualified majority is not obtained, the EC may bring forward its own decision to authorise the re-approval of a chemical. On 29 June 2016, the EC extended the approval of glyphosate in the EU to allow the ECHA to complete its assessment of glyphosate. This approval will expire either 6 months following the date of receipt of the ECHA report or 31 December 2017, whichever occurs first (EC 2016). On 11 July 2016, Member State experts voted as a qualified majority in favour of two recommendations proposed by the EC as conditions to the registration extension, at a meeting of the Standing Committee in Plants, Animals, Food and Feed. These restrictions included:

- an EU-wide ban on POEAs contained in some glyphosate-based formulations
- restricted use of glyphosate-based formulations in public parks, playgrounds and home gardens and for pre-harvest application.

In July 2016, the pesticide regulator in Malta (the Malta Competition and Consumer Affairs Authority) began implementing a policy decision by the Environment Ministry to withdraw authorisation for all glyphosate and glyphosate-based formulations.

Glyphosate is currently authorised throughout the EU and UK, predominantly for uses in agriculture (cereals, vineyards, olives, citrus, nuts etc), but also to manage weed growth on non-cultivated areas (eg railway tracks, verges), public amenities, forestry and aquatic environments, and in home gardens. Glyphosate is authorised for weed control use after harvest or sowing, before a new crop is planted. Glyphosate is also authorised for pre-harvest weed control use and dessication (to promote the maturation of crops) in crops such as oilseed rape and cereals. It is not currently clear which uses will be affected as a result of the recently announced use restrictions described above.

2.4 New Zealand

In New Zealand, the registration of herbicides is the responsibility of the Environmental Protection Authority and the Ministry for Primary Industries. Glyphosate is listed on the Chief Executive Initiated Reassessment (CEIR) Programme and as such is being actively monitored by the Environmental Protection Authority.

Glyphosate has been registered in New Zealand since 1976 and is used in various settings, including orchards, vineyards, pastures, vegetable patches, along roadways and in parks, sporting fields and home gardens.

3 EVALUATION METHODOLOGY: THE WEIGHT OF SCIENTIFIC EVIDENCE

Consistent with the scientific method, a weight-of-evidence approach should be used to determine whether a chemical is carcinogenic. To conduct an initial quality assessment of each individual study, the study design should be assessed, taking into account OECD (Organisation for Economic Co-operation and Development) or national test guidelines where appropriate. In a weight-of-evidence assessment, any observation should be reproducible: the strength of any finding will be increased if it can be replicated under the same conditions in more than one laboratory. Plausible patterns in the hierarchy of the results will also strengthen the finding—ie where a finding *in vitro* is reproduced *in vivo*.

In toxicological science, there are a number of criteria that are used to determine whether an effect, such as cancer, is treatment-related and adverse:

- *Dose-response relationship*—the number of animals or subjects showing the effect and/or the severity of the effect should increase with dose. There should be a progression to a more severe state of toxicity as the dose and duration of dosing increases.
- *Consistency of the effect*— the effect should be observed consistently across studies of similar exposure duration and sexes (in unusual cases an effect may be sex-specific). Additionally, an effect should be corroborated by related toxicological endpoints – for example, increases in malignant neoplasms should be preceded by cellular changes that should be observed at lower doses or following shorter exposure durations.
- *Statistical significance*—differences between treated groups and the concurrent control group should be statistically significant. However, statistical significance on its own does not imply biological significance and the absence of statistical significance also does not necessarily mean the absence of an effect (for example a rare type of tumour may be highly biologically relevant).
- *Biological plausibility*—an observed effect needs to be mechanistically plausible based on the characteristics of the chemical and principles of biology/physiology.
- *Natural variation and incidental findings*—the normal range of natural variation of a parameter in the test species needs to be understood through the use of age- and sex-matched historical control data. All laboratory animal strains used in rodent bioassays have a background incidence of age- and sex-related neoplasms at different tissue sites. It is critical that this normal range of biological variation is documented and understood.

When assessing toxicological data associated with chemical residues in food, the APVMA has regard to the principles and methods outlined by the IPCS, described below in Section 4.3 (IPCS 2009) including guidance on the interpretation of toxicological data by JMPR[1] and OECD[2]. For the evaluation of carcinogenicity via dietary or other exposure routes, the IPCS has published a mode-of-action (MOA) framework for chemical carcinogenesis (Meek et al 2013). In this framework, treatment-related cancer must first be demonstrated in laboratory animals

[1] http://www.who.int/foodsafety/publications/jmpr_guidance_document_1.pdf?ua=1
[2] http://www.oecd-ilibrary.org/docserver/download/9750321e.pdf?expires=1472172141&id=id&accname=guest&checksum=28F68D5204F38A1B96055A611D12C4DF

before proceeding to examine genotoxicity data, human epidemiological and mechanistic data in order to determine the mechanism for how cancer arises and the human relevance of adverse effects observed in laboratory animals.

The APVMA considered aspects of study design and reporting that may either increase or decrease confidence in the data. The presence of a dose-response relationship, consistency and reproducibility were considered to increase confidence in the data, while any unexplained inconsistencies and significant deviations from international test guidelines were considered to reduce confidence in the data. Therefore, those studies that demonstrated a dose-response relationship, adhered to international test guidelines (where appropriate) and were consistent and reproducible within and/or between laboratories were given more weight in the assessment.

For epidemiological data, the APVMA considered prospective cohort studies to be more powerful than retrospective case-control studies, which are more prone to recall bias and confounding by exposure to other chemicals and environmental situations. It is well known that study participants' memory may not be reliable: participants are often asked to provide information about use patterns that occurred many years previously, participants may be providing information relating to a family members' usage (not their own) and it is possible that a participant with cancer may have spent more time thinking about possible causes and exposure scenarios than participants without cancer. It is also very difficult to separate usage of one pesticide from another: those who routinely use glyphosate-based formulations are likely to have been using many other types of agricultural and/or industrial chemicals, or be exposed to other occupational scenarios that may confound the data.

3.1 Use of international test guidelines

All scientific studies considered by the APVMA are assessed on their scientific merits. However, studies that have been conducted according to principles of Good Laboratory Practice (GLP) and comply with international test guidelines are preferred because of the assurance of their scientific quality.

To ensure the scientific quality of studies submitted for regulatory purposes and to enable comparison of studies utilising the same methodology in different laboratories, a number of internationally accepted test guidelines have been developed for various toxicological studies. The testing guidelines produced by the OECD are commonly used throughout the world and provide quality standards for different types of studies. Guidance is provided regarding test species and strain, the number of animals to be used, choice of chemical doses and duration of exposure, as well as parameters to be measured, observed and reported. By comparing studies that were conducted using equivalent test guidelines, regulators can identify potential human health hazards and set appropriate endpoints for risk assessment and management.

When assessing toxicology studies, consistency with international test guidelines is not the only measure of scientific quality. For some types of studies, guidelines have not yet been developed while for studies that were never intended for regulatory or risk assessment purposes (eg most studies published in scientific journals) some criteria may rarely be met. However, depending on how the study design, interpretation or reporting differs from the guidelines, the discrepancies may not affect the validity of the results. Specifically, data for individual animals is rarely reported in scientific publications; instead the data is presented as group means along with a measure for variance between control and treatment groups. This omission would not be considered a serious flaw and invalidate the study results. However, other elements of the testing guidelines may be considered more critical and omission may invalidate the study findings. For example, failure to independently code slides (or failure to report independent coding) used to visually score assay results would be considered as a potentially critical flaw, as it

would not be clear that the scoring was performed by an independent observer who was not aware of the treatment or control group being scored. In other cases, test guidelines may stipulate a maximum dose that is associated with minimal toxicity, for determining a specific carcinogenic or genotoxic end-point. In some experimental studies, that maximum dose may be exceeded up to ten-fold. In the absence of appropriate cytotoxicity tests, it may not be possible to determine whether any positive effects are indeed indicative of genotoxicity.

3.2 Statistical significance and biological or toxicological relevance

Statistical analysis is a useful tool for detecting differences between groups exposed to a test compound or not. Biologically this difference may be real or a chance or incidental finding. That is why a statistically significant result on its own without an evaluation of its biological and ultimately toxicological relevance provides only limited insight into the possible effects of a chemical. As described above, there are a range of other criteria that must be met in order to conclude that an effect is truly treatment-related and adverse.

Epidemiological data is often presented using an Odds Ratio (OR) with an associated confidence interval (CI; usually 95%). An OR is a relative measure of effect and is used in this context to compare the incidence of cancer (or some other health outcome) in individuals exposed to glyphosate with those who have not been exposed. If the OR is 1, the statistical analysis implies that there is no difference between the incidences of cancer in either group. The CI is used to determine the level of uncertainty around the OR, because the sample population used in the study is only a representative group of the overall population. The statistical test infers that the true population effect lies between the upper and lower CI. Therefore, a very narrow CI infers that the true effect is very close to the estimated OR, while a wide CI infers that the OR is less reliable. In addition, if the CI crosses 1 (eg 0.5–1.5), the statistical test is inferring that there is no difference between the two groups, in terms of cancer incidence. Therefore, the APVMA considered studies reporting positive associations between glyphosate exposure and cancer incidence that presented an OR greater than 1 and a narrow CI range that did not cross 1 to be more powerful than studies that had a wide CI range that crossed 1.

3.3 Historical control data and spontaneous tumour incidence

Consideration of historical control data is an important aspect of interpreting toxicology studies. Historical control data is a compilation of the findings from strain-, age- and sex-matched control animals from all the studies undertaken by the performing laboratory and provides an indication of the background frequency of tumours that occur in that species/strain of animals by chance. A statistically significant increase in tumour frequency may be observed in treated animals when a lower than normal tumour frequency is observed in control animals in that study. Conversely, a non-significant result may be observed when a higher than normal tumour frequency is observed in the control group. Therefore, historical control data is used to determine whether an increase in tumours is within the realms of normal biological variation or is in fact truly treatment related. For some common tumours
(eg liver, pituitary or adrenal), the historical control ranges are so wide that the incidences of tumours in both the concurrent control and treated groups often fit within their bounds. In these cases, the mean value or distribution of historical control data may be more useful than the range only.

3.4 Test species and route of administration

Data obtained from humans is preferable to data obtained from experimental animals because it increases the certainty that an observed effect is relevant to humans. Volunteer studies and human clinical trials provide accurate exposure metrics that can be directly linked with adverse outcomes. However, the extent of exposure can be difficult to determine in human observational studies (such as epidemiological studies), because subjects are often expected to rely on memory recall to provide exposure details and subjects are frequently exposed to more than one chemical. When evaluating studies conducted using animal models, those that use mammals are considered more relevant to human outcomes than non-mammalian species or *in vitro* cell culture studies.

When evaluating the toxicological effects of pesticides, such as glyphosate, studies in which the chemical was administered via the oral (gavage, diet, drinking water), dermal or inhalational routes are highly relevant because these are the only possible routes of exposure for humans. Subcutaneous (skin injection), intravenous (vein injection) and intraperitoneal (stomach cavity injection) administration are generally not directly relevant for chemical risk assessment purposes because humans would not be exposed via these routes. In addition, these routes of exposure bypass normal metabolic processes.

4 SUMMARY OF ASSESSMENTS AND CONCLUSIONS

4.1 The IARC glyphosate monograph

The IARC is a specialist cancer agency of the WHO and, as such, follows the general governing rules of the United Nations. However, IARC has its own Governing Council and Scientific Council. Currently, 25 countries are IARC members, including Australia.

The IARC assessment process

The IARC appoints a Working Group to evaluate carcinogenic risks to humans, which is guided by the Preamble (IARC 2006). The Preamble is a statement of scientific principles; however, the procedures that each Working Group use to implement those scientific principles are not specified and are the prerogative of each individual Working Group. The Monographs produced by the Working Groups assess the strength of available evidence that an agent could alter the age-specific incidence of cancer in humans. Working Group members have usually published significant research related to the carcinogenicity of the agents being reviewed.

The IARC Monographs evaluate cancer hazards and the Preamble emphasises the distinction between a hazard and a risk. A cancer hazard is defined in the Preamble as 'an agent that is capable of causing cancer under some circumstances' while a cancer risk is defined as 'an estimate of the carcinogenic effects expected from exposure to a cancer hazard'. The Preamble cautions that the Monographs identify cancer hazards even when the risks are very low at current exposure levels (IARC 2006).

The IARC assessments also utilise a 'strength-of-evidence' approach, rather than the 'weight-of-evidence approach' more common in regulatory assessments. The weight-of-evidence approach assesses the predictive validity of a hypothesis, while the strength-of-evidence determines its level of extremeness (Simon 2014). Predictive validity is dependent on factors such as study design, sample size, background rates etc. A strength-of-evidence assessment may be based on a single study where the effect was easily noticeable or was apparent in a large population, even though the predictive value of the study was weak.

The IARC Preamble states that while the Monographs are used by regulatory authorities worldwide to make risk assessments and formulate regulatory decisions, they represent only one part of the body of information that informs regulatory decisions (IARC 2006). The Preamble acknowledges that public health options vary according to circumstance and geographical location and relate to a multitude of factors. As a result, the IARC does not regard regulation or legislation while developing Monographs, as it acknowledges that this is the responsibility of individual governments or other international organisations.

When assessing an agent for a Monograph, the Working Group reviews epidemiological studies, cancer bioassays in experimental animals, as well as exposure, mechanistic and other relevant data. In each case, the Working Group only considers data that has been determined by them to be relevant to the evaluation. Only reports that have been published or accepted for publication in the openly available scientific literature and data from government agency reports that are publicly available are reviewed (IARC 2006). Unlike regulatory authorities, IARC does not consider the often large number of unpublished studies submitted for regulatory assessment.

The outcome of the Working Group's assessment is a categorisation of an agent that reflects the strength-of-evidence from studies in humans and experimental animals and other relevant data. The classifications used by IARC and the circumstances that may lead to an agent being assigned to each group are listed below (IARC 2006):

- Group 1 – the agent is carcinogenic to humans
  - there is sufficient evidence of carcinogenicity in humans
  - evidence of carcinogenicity in humans is less than sufficient but there is sufficient evidence of carcinogenicity in experimental animals and strong evidence that the agent acts through a relevant mechanism of carcinogenicity in humans (exceptional circumstances)
- Group 2A – the agent is probably carcinogenic to humans
  - limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals
  - inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals and strong evidence that carcinogenesis is mediated by a mechanism that also operates in humans
  - limited evidence of carcinogenicity in humans but the agent clearly belongs to a class of agents for which one or more members have been classified in Group 1 or Group 2A (exceptional circumstances)
- Group 2B – the agent is possibly carcinogenic to humans
  - limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals
  - inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals
  - inadequate evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals, as well as supporting evidence from mechanistic and other relevant data
  - strong evidence from mechanistic and other relevant data.
- Group 3 – the agent is not classifiable as to its carcinogenicity to humans
  - inadequate evidence of carcinogenicity in humans and inadequate or limited evidence of carcinogenicity in experimental animals
  - inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals when there is strong evidence that the mechanism of carcinogenicity in experimental animals does not operate in humans (exceptional circumstances)
  - agents that do not fall into any other group.
- Group 4 – the agent is probably not carcinogenic to humans
  - evidence suggesting lack of carcinogenicity in humans and experimental animals
  - inadequate evidence of carcinogenicity in humans but evidence suggesting lack of carcinogenicity in experimental animals, consistently and strongly supported by a broad range of mechanistic and other relevant data.

Assessment of glyphosate by IARC

In March 2015, IARC evaluated the potential carcinogenicity of five organophosphate pesticides and classified glyphosate (as well as malathion and diazinon) as 'probably carcinogenic to humans', Group 2A. The complete monograph was published in July 2015. Note that where the Working Group cited an unpublished study, it relied on the published summary report as the complete, original study report was not available.

The Working Group concluded that there was 'limited evidence of carcinogenicity' in humans, with a positive association observed between exposure to glyphosate and NHL (IARC 2015). The IARC preamble explains that 'limited evidence of carcinogenicity' in humans is concluded when the Working Group has determined that a credible causal link between the agent and cancer may have been identified 'but chance, bias or confounding could not be ruled out with reasonable confidence' (IARC 2006). The Working Group also concluded that there was 'sufficient evidence of carcinogenicity' in experimental animals (IARC 2015). The IARC Preamble describes that sufficient evidence of carcinogenicity is concluded when a causal relationship between the agent and an increased incidence of malignant neoplasms or an appropriate combination of benign and malignant neoplasms has been established in either two or more species of animals, or two or more independent studies in one species. Sufficient evidence is also considered to be established when an increased incidence of tumours is observed in both sexes of a single species in a well conducted study (preferably conducted according to GLP). Alternatively, sufficient evidence of carcinogenicity may be considered established in a single study in one species and sex when malignant tumours occur to an 'unusual degree with regard to incidence, site, type of tumour or age at onset, or when there are strong findings of tumours at multiple sites' (IARC 2006).

The studies relied on by the Working Group for human carcinogenicity comprised reports of the Agricultural Health Study (AHS) and various case-control studies conducted in the US, Canada and Sweden. The Working Group concluded that these studies presented increased risks for the development of NHL associated with exposure to glyphosate (IARC 2015).

The AHS was a prospective cohort study of 54 315 licensed pesticide applicators from Iowa and North Carolina, which has produced data relating to the use of pesticides, such as glyphosate on the risk of cancer at various sites. Overall, the study concluded that exposure to glyphosate was not associated with all cancers combined (RR 1.0; 95% CI 0.90–1.2) or any cancer at a specific anatomical site (De Roos et al. 2005).

A study conducted in Canada reported an increased risk of NHL following more than 2 days per year of exposure to glyphosate in 51 exposed cases (OR 1.20; 95% CI 0.83–1.74 when adjusted for age, province and medical variables) (McDuffie et al. 2001); however, no adjustment for other pesticides was performed and the OR spans 1 (indicating that there was no difference between the incidence of cancer in either group). A study conducted in the US (De Roos et al. 2003) and two studies conducted in Sweden (Hardell & Eriksson 1999; Eriksson et al. 2008) reported an increased risk of NHL following glyphosate exposure, which persisted following adjustment for other pesticides. However, the results of Hardell & Eriksson (1999) should be treated with caution, as only 4 glyphosate-exposed cases and 3 controls were included and while an increased OR was reported (2.3), the 95% CI was wide (0.40–13.0), indicating poor precision and spans 1, indicating that there was no difference between the incidence of cancer in either group. Hardell et al. (2002) analysed pooled data that included the data presented in Hardell & Eriksson (1999)—a non-statistically significant elevated risk for NHL following glyphosate exposure with poor precision and an OR that spans 1 was identified (OR 1.86; 95% CI 0.55–6.20). In 29 exposed cases and 18 controls, Eriksson et al. (2008) reported an increased risk for NHL following more than 10 days/year exposure to glyphosate (OR 2.36; 95% CI 1.16–4.40) following adjustment for exposure to other pesticides. After pooling

data from three case-control studies of NHL conducted in the Midwest US in the 1980s, De Roos et al. (2003) reported an increased incidence of NHL following exposure to a number of individual pesticides, including glyphosate (OR 2.1; 95% CI, 1.1–4.0), based on 36 cases. However, while an increased risk was still identified following adjustment for exposure to other pesticides (OR 1.6, 95% CI 0.90–2.8), it was no longer significant. A case-control study also conducted among males in the Midwest US reported an increased risk of developing NHL for men who had ever farmed (OR 1.2; 95% CI, 1.0–1.5) and men who had ever handled glyphosate (OR 1.1; 95% CI, 0.7–1.9); however, no adjustment was made for other pesticides (Cantor et al. 1992). No association between glyphosate exposure and development of NHL was calculated in a hospital-based case-control study conducted in France (OR 1.0; 95% CI 0.5–2.2) (Orsi et al. 2009); however, only 12 exposed cases were assessed. One study conducted in Europe reported an elevated risk for B-cell lymphoma following glyphosate exposure (OR 3.1; 95% CI 0.6–17.1), but again, this study was based on few exposed cases (n=4) and controls (n=2), with a very wide CI (poor precision) that spans 1 and the authors of the paper concluded that no increased risk of either lymphoma overall, or B cell lymphoma was associated with glyphosate exposure (Cocco et al. 2013).

The Working Group also relied on three studies that reported an increased risk of multiple myeloma (a subtype of NHL) following more than 2 days glyphosate exposure per year (Brown et al. 1993; Orsi et al. 2009; Kachuri et al. 2013). However, none of these studies adjusted for the effect of other pesticides and in all three studies, the results were not statistically significant. Therefore, the variation observed in the results could be attributable to normal biological variation and not exposure to glyphosate or other pesticides. A report of data obtained by the AHS found no association between glyphosate exposure and NHL (OR 1.1; 95% CI 0.5–2.4; n=54 315) but saw an increased risk of multiple myeloma when the data were adjusted for multiple confounders, such as demographic and lifestyle factors, as well as other pesticides (OR 2.6; 95% CI 0.7–9.4; n=40 716) (De Roos et al. 2005). However, the number of myeloma cases included in the study was small (32 cases out of 2088 total cancer cases) and the wide CI spanning 1 indicates poor precision and a lack of difference between groups. Re-analysis of the data determined that the increased risk of multiple myeloma (OR 1.24; 95% CI 0.52–2.94) was only present in the subset of subjects for which there was no missing data (22 cases); however, again, the CI spans 1 (Sorahan 2015). This re-analysis of the data concluded that the observed increased risk of developing multiple myeloma following glyphosate exposure resulted from the use of an unrepresentative restricted dataset and that analysis of the full dataset provided no convincing evidence that glyphosate exposure is linked with the development of multiple myeloma (Sorahan 2015).

The studies relied on by the Working Group for animal carcinogenicity comprised two dietary studies in male and female mice, five dietary studies in male and female rats, as well as one drinking-water study of a glyphosate-based formulation in male and female rats.

In mice, one dietary study reported in summary form by the US EPA calculated a positive trend in the incidence of renal tubule carcinoma and renal tubule adenoma/carcinoma combined in male, but not female mice (IARC 2015). A second dietary study reported by the JMPR (2006) in mice observed a significant positive trend in the incidence of haemangiosarcoma incidence in male, but not female mice (IARC 2015). However, haemangiosarcomas were only observed at the highest dose tested in male mice (4/50; 8%). In females, haemangiosarcomas were reported at the lowest (2/50, 4%) and highest (1/50, 2%) doses tested.

Three dietary studies in rats evaluated by the JMPR found no significant increase in tumour incidence in any tissue (JMPR 2006). Of the remaining two studies (evaluated by the US EPA), one reported an increase in the incidence of pancreatic cell adenoma in male rats only; however, no statistically significant dose-response was evident and there was no progression to carcinomas (IARC 2015). In the final study, a significant increase in the incidence of

pancreatic islet cell adenoma and hepatocellular adenoma in males and thyroid C-cell adenoma in females was reported. However, again, there was no statistically significant dose-related trend in the incidence of pancreatic islet cell adenomas and no progression to carcinoma for any tumour type (IARC 2015). No significant increase in tumour incidence was observed following administration of a glyphosate formulation (13.85% solution, purity of glyphosate not reported) to rats in drinking water.

The Working Group concluded that there was strong evidence that glyphosate and glyphosate-based formulations are genotoxic and, along with the main metabolite, AMPA can act to induce oxidative stress. Two studies investigated genotoxicity following exposure of community residents to glyphosate-based formulations, reporting chromosomal damage (micronucleus formation) in blood (Paz-y-Miño et al. 2007) and significant increases in DNA damage (DNA strand breaks) (Bolognesi et al. 2009) four or two months following spraying, respectively. Other studies assessing the effects of either glyphosate or glyphosate-based formulations in human cells *in vitro* produced varied results (IARC 2015). The majority of the studies relied on by the Working Group that assessed genotoxicity in human cells *in vitro* reported DNA damage (DNA strand breaks), which can also be indicative of cytotoxicity and not just genotoxicity. Two studies were relied on by IARC as evidence of chromosomal damage in human lymphocytes *in vitro*. Both studies reported that glyphosate did not produce chromosomal damage without metabolic activation (Manas et al. 2009; Mladinic et al. 2009b). One study reported micronucleus formation following metabolic activation at the highest concentration tested only, but no concentration-related increase in micronucleus formation was evident (Mladinic et al. 2009b). Similarly, experiments utilising glyphosate or glyphosate-based formulations conducted in animals, both *in vivo* and *in vitro* produced varied results (IARC 2015). As for mammalian cells *in vitro*, many of the non-human mammalian genotoxicity studies utilised a DNA damage endpoint, which may be associated with cytotoxicity, rather than genotoxicity. One study assessing mutations in mouse uterine cells reported negative results. Four of the nine studies that assessed chromosomal damage (micronucleus formation) in mouse bone marrow cells produced negative results. Of the remaining five studies that reported positive results, three tested a single dose only, one reported a positive effect at the highest dose tested only and one reported a positive effect at the lowest dose tested only (IARC 2015). No chromosomal aberrations were reported following exposure to glyphosate (single ip dose) (Li & Long 1988) or a single oral dose of a glyphosate-based formulation in mouse bone marrow cells (Dimitrov et al. 2006); however, a single ip dose of a glyphosate-based formulation increased chromosomal aberration in a dose- and time-dependent manner (Prasad et al. 2009).

The Working Group concluded that there was weak evidence that glyphosate may affect the immune system and that glyphosate or glyphosate-based formulations induce receptor-mediated effects, such as aromatase activity. The Working Group also concluded that glyphosate-based formulations may affect cell proliferation or death, the latter via apoptosis; however, glyphosate alone either had no effect or had a weaker effect than the formulated products (JMPR 2006; IARC 2015).

4.2 Assessment of the IARC Monograph

The assessment of the IARC Monograph was undertaken by the Department of Health (OCS). The APVMA requested that OCS conduct a preliminary scoping review of the IARC Monograph to ascertain the relevance of the carcinogenicity classification of glyphosate and any implications that this may have to the registration of glyphosate and glyphosate-based formulations in Australia. In particular, the APVMA requested that OCS identify any relevant data not previously evaluated by Australia. This constituted Tier 1 of the OCS assessment (Supporting document 1).

Tier 2 of the OCS scoping assessment involved a detailed review of any studies that had been reviewed by IARC as part of its assessment of glyphosate and were identified by OCS as requiring further review during the Tier 1 assessment (Supporting document 2).

Previous OCS epidemiological review in 2005

An association between reported glyphosate use and an increased risk of NHL was reviewed by the OCS in 2005 (unpublished). Therefore, the OCS did not assess the epidemiological studies described in the IARC monograph published prior to 2005 and recommended that the APVMA rely on international assessments for any additional epidemiological information relating to glyphosate exposure. The OCS' unpublished 2005 assessment of epidemiological information relating to glyphosate exposure is summarised below.

The first report of an association of glyphosate exposure with NHL was from a case-control study conducted in Sweden; however, this estimate was based on only four exposed cases and three controls (Hardell & Eriksson 1999). A pooled analysis of this initial study with a study of hairy cell leukaemia (a rare subtype of NHL) suggested a relationship between glyphosate exposure and an increased risk of the disease (unadjusted analysis with an OR of 3 and 95% CI 1.1–8.5) (Hardell et al. 2002). A more extensive study across a large region of Canada found an increased risk of NHL associated with glyphosate use of 2 days or more per year, based on 23 exposed cases and 31 controls (OR = 2.1; 95% CI 1.2–3.7) (McDuffie et al. 2001). In a pooled analysis of case-control studies conducted in the US, De Roos et al. (2003) reported an association between glyphosate exposure and increased NHL risk in men after adjustment for other commonly used pesticides, based on 36 exposed cases and 61 controls (OR = 2.1; 95% CI 1.2–4.0).

By contrast, in another cohort study, De Roos et al. (2005) reported that glyphosate exposure was not associated with increased NHL risk in men after adjustment for other commonly used pesticides, based on 92 exposed cases. One plausible explanation for this conflicting result is that all previous studies had a lower number of exposed cases and were retrospective in design, and thereby susceptible to recall bias of exposure reporting. As information on exposures is obtained by questionnaires and interview of farmers or their next-of-kin, often years after the event, the quality of data on pesticide use obtained by recall is questionable (Blair et al. 2002). Indeed, recall bias is particularly problematic for widely used products such as Roundup and the potential for recall bias and for misclassification of pesticides were acknowledged as one of the limitations in all such studies. On the other hand, the study by De Roos et al. (2005) reported a higher number of exposed cases and was prospective in design, which should have largely eliminated the possibility of recall bias. On this basis and also based on the toxicity profile of glyphosate derived from animal studies, it is unlikely that exposure to this chemical is associated with an increased risk of NHL.

This is further supported by a recent epidemiological report showing that NHL incidence decreased between 1991–2000 in Sweden, Finland, Denmark and the US (Hardell & Eriksson 2003), a period in which glyphosate use increased very significantly. It is of interest to note that decreased NHL incidence during this period in Sweden also coincides with a decline in the prevalence of human immunodeficiency virus (HIV), which has been shown to be a risk factor for NHL (Pluda et al. 1993).

Tier 1 assessment of the IARC glyphosate monograph

Tier 1 assessment outcomes

REFERENCE LIST AND KEY STUDY REVIEW

The OCS examined the reference list from the IARC Monograph 112, which included 264 published papers. Publicly available papers were sourced and designated as either:

- relevant for the carcinogenicity classification for humans and requiring further analysis (Tier 2, Part 1)
  - studies previously reviewed by the EU or
  - studies not previously reviewed by the OCS or EU and
    - studies that used glyphosate technical
    - studies that investigated carcinogenicity, genotoxicity or oxidative stress
    - Studies that used relevant test animal models or cell lines, eg mouse, rat, human lymphocytes
- relevance for the carcinogenicity classification for humans unclear and to be determined internationally (the APVMA will rely on international assessment of these studies)
  - studies previously reviewed by the EU or
  - studies not previously reviewed by the OCS or EU and
    - studies that used a formulation of glyphosate
    - studies that were unclear as to the formulation or combination of active constituents used
    - Studies that do not fit the criteria for the other designations
- not relevant to the classification and excluded
  - studies previously reviewed by the OCS
  - studies undertaken using animal models or cell lines not relevant for assessing human toxicity; eg fish, frogs, bovine
  - studies investigating endpoints not relevant to a carcinogenicity classification; eg endocrine disruption, reproduction, immune function, neurotoxicity
  - environmental fate and residue studies
  - determination of glyphosate in air, soil, water or in vivo
  - market/industry summary publications
  - case studies regarding glyphosate poisoning
  - occupational exposure or biomonitoring studies.

Following analysis of the study abstracts, 174 references were excluded from requiring further review. The majority of these papers were excluded because the study utilised non-conventional species or methodology for evaluating human toxicity (eg fish). A total of 19 references were considered relevant to the carcinogenicity classification of glyphosate, requiring further in-depth revision. Of these 19 studies, 9 had been previously reviewed by the EU in

2013 and 10 had not previously been reviewed by either the OCS or the EU. The remaining 71 references were considered to require further review to determine their relevance to the carcinogenicity classification. Of these 71 references, 19 had been previously reviewed by the EU in 2013, five were referenced as US EPA papers (not referenced by the EU) and 47 had not been previously reviewed by either the OCS or EU. These studies will be assessed in detail by the JMPR in 2016.

RECOMMENDATIONS

Based on the Tier 1 assessment, the OCS recommended an evaluation of the studies listed in Table 4 (Appendix A) and an evaluation of the EU position for the key studies listed in Table 5 (Appendix B). This review constituted Tier 2 of the OCS scoping assessment of glyphosate. The studies referenced in the IARC Monograph that were not recommended for evaluation by the OCS are listed in Appendix C (Table 6).

The OCS noted that parallel reviews of the IARC Monograph were being planned or were in progress by independent expert international bodies (eg JMPR). Therefore, the OCS recommended that rather than undertaking a full review in isolation, the APVMA make use of this international assessment. This approach is consistent with the APVMA's policy on the use of international assessments.

Tier 2 assessment of the IARC glyphosate monograph

The Tier 2 assessment involved:

- Evaluation of 19 studies relevant to the carcinogenicity classification of glyphosate (Table 4, Appendix A). Of these, 16 were either considered or critically appraised by EFSA (2015).
  - 12 genotoxicity studies
  - 5 oxidative stress studies
  - 1 epidemiology study
  - 1 classification review report.

The Tier 2 assessment did not include a detailed review of the epidemiological studies or studies that evaluated the possible carcinogenicity of glyphosate-based formulations, as a number of international reviews of the IARC Monograph will be undertaken concurrently with the OCS assessment. A total of 47 studies that were not reviewed by the EU Renewal Assessment Report (RAR) and 19 studies that were reviewed by the EU RAR (Table 5, Appendix B) were not reviewed by the OCS in the Tier 2 assessment of glyphosate because their relevance to the carcinogenicity classification for humans was unclear. The APVMA will rely on international assessments of these studies.

Animal carcinogenicity studies

The OCS evaluated one published study that reviewed animal carcinogenicity studies to support regulatory requirements (Greim et al. 2015). The review paper included nine rat and five mouse studies in a weight-of-evidence assessment of the carcinogenicity of glyphosate that included a review of absorption, distribution, metabolism and excretion (ADME), acute toxicity, genotoxicity, epidemiology and animal chronic toxicity studies.

The authors refer to an article that qualitatively analysed the outcomes from seven cohort studies and 14 case-control studies that examined an association between glyphosate and cancers. No consistent pattern of positive statistical associations between total cancer or site-specific cancer in adults or children exposed to glyphosate was evident (Mink et al. 2012). All studies cited by Mink et al. (2012) were referenced in the IARC Monograph and five (Nordstrom et al. 1998; Hardell & Eriksson 1999; McDuffie et al. 2001; Hardell et al. 2002; De Roos et al. 2005) were included in a previous assessment of glyphosate by the OCS in 2005, which concluded that glyphosate is not mutagenic or carcinogenic and it is unlikely that exposure to glyphosate is associated with an increased risk of NHL. Of the remaining studies cited by Mink et al. (2012), four (Brown et al. 1990; Cantor et al. 1992; Carreon et al. 2005; Andreotti et al. 2009) were considered during the Tier 1 assessment as not appropriate for review because glyphosate was not referred to in the abstract and the remaining 12 were identified as requiring additional assessment in order to determine their relevance to the assessment. Therefore, a detailed appraisal of this paper was not conducted by the OCS as a part of the Tier 2 assessment.

Several one year toxicity studies in animals were reviewed by Greim et al. (2015) but not discussed in detail, as they were not designed to detect neoplasms. However, studies conducted in both rats and dogs indicated low toxicity of glyphosate following repeated daily exposure.

Greim et al. (2015) evaluated five chronic toxicity/carcinogenicity studies (conducted over a minimum duration of 18 months) in mice, four of which were considered reliable and were performed according to GLP following OECD testing guidelines (OECD TGs). In four of those studies, spontaneous tumours were observed at all doses. As no dose-response was observed, these were not considered to be treatment-related. One study observed evidence for an increase in the incidence of malignant melanomas at the highest dose tested; however, this tumour is known to be a common spontaneous tumour in the strain of mouse tested. Another study reported increased incidence of bronchio-aveolar adenocarcinoma and malignant lymphoma at the highest dose tested only; however, these were only observed in males and are known to be a common age-related neoplasm in the strain of mouse tested.

Greim et al. (2015) evaluated nine chronic toxicity/carcinogenicity (24 to 29 months) studies in rats submitted by industry, seven of which were conducted according to principles of GLP. Of the two non-GLP studies, one was conducted prior to the introduction of GLP. Some of the studies reported spontaneous and/or age-related neoplasms that did not exhibit a dose-response relationship and were therefore not considered treatment-related. In some cases, the tumours observed were known to be common age-related tumours in the particular strain of rat used. In addition, some studies reported the development of benign tumours that did not exhibit a dose-response relationship and did not progress to malignant neoplasms. Other studies reported no increase in tumour incidence following glyphosate exposure.

Greim et al. (2015) combined the results from the animal studies with results from human carcinogenicity epidemiology conclusions reported by Mink et al. (2012)[3] and concluded that glyphosate is not carcinogenic. They noted that while some studies reported an increase in a specific neoplasm at high dose, the pooled data did not identify any consistent pattern of neoplasm development or dose-response relationship. Therefore, the authors

[3] Mink et al (2012) concluded that there was no consistent evidence of an association between exposure to glyphosate and cancer in humans.

concluded that the observed effects were not consistent or reproducible and were not treatment related. The OCS agreed with the conclusion that the evidence indicates that glyphosate is not carcinogenic in animals.

Genotoxicity

The OCS appraised 11 studies and one review paper that assessed the genotoxicity of glyphosate.

DNA DAMAGE

Of these studies, six assessed genotoxicity via the comet assay (or single cell gel electrophoresis; SCGE) *in vitro*, using lymphocytes (Mladinic et al. 2009a; Mladinic et al. 2009b; Alvarez-Moya et al. 2014), HepG2 cells (liver carcinoma cells) (Gasnier et al. 2009), Hep-2 cells (epithelial carcinoma cells derived from a cervical cancer) (Manas et al. 2009), GM38 cells (diploid fibroblast cells) or HT1080 cells (fibrocarcinoma cells) (Monroy et al. 2005). All of these studies were considered by the EFSA RAR (2015). As previously described, DNA damage observed using sister chromatid exchange (SCE) or the comet assay is regarded as an indirect measure of genotoxicity and positive results using these endpoints may reflect induction of cytotoxicity, rather than genotoxicity, as DNA damage does not directly measure heritable events or effects that are closely associated with heritable events (Kier & Kirkland 2013).

The OECD TG 489 (2014) for comet assays specifies that exposure to the test substance should occur *in vivo* and cells subsequently isolated and analysed. In contrast, the study by Alvarez-Moya et al. (2014) exposed isolated human peripheral blood lymphocytes directly in vitro to the test substance. Therefore, it is difficult to compare these results with other studies as the exposed cells are likely to be more sensitive to direct exposure. Given this and other limitations in study design and reporting (including a lack of data relating to cytotoxicity), the OCS concluded that the genotoxic effects of glyphosate could not be determined from this study and that it was not reliable for regulatory purposes. Mladinic et al. (2009a) concluded that glyphosate technical is not genotoxic and does not cause oxidative stress at levels relevant to human exposure, and recommended further research utilising a larger sample population. The EFSA RAR (2015) noted that, while the study was a non-GLP, non-guideline study, it met broad scientific principles to determine genotoxicity; however, the positive results obtained at the highest dose tested may reflect cytotoxicity, rather than a true chromosome effect that would indicate genotoxicity. The OCS agreed with the assessment and concluded that the study demonstrated that glyphosate is not genotoxic and does not cause oxidative stress at concentrations relevant to human exposure, but that the results are only reliable as supporting evidence for regulatory purposes. In another study, the same research group concluded that glyphosate technical did not damage DNA at levels of expected human exposure (Mladinic et al. 2009b). However, the EFSA RAR noted a number of critical deficiencies in the study design and reporting (eg the study was not conducted according to GLP or international guidelines, and the proposed mechanism of genotoxicity is not relevant to human exposure levels). The OCS agreed with the conclusion of EFSA that the study is not suitable for regulatory (ie risk assessment) purposes.

Manas et al. (2009) concluded that glyphosate technical was genotoxic (as evidenced by DNA damage) in human Hep-2 cells between 3.00 and 7.50 mM (higher concentrations were cytotoxic) and Gasnier et al. (2009) concluded that exposure to a glyphosate-based formulation was genotoxic to human liver carcinoma (HepG2) cells. However, the study design and level of reporting detail of both studies was criticised by both EFSA and the OCS for a number of reasons. The positive results obtained by Gasnier et al. (2009) were observed only at exceedingly high concentrations that were above the limit dose limit, the potential for cytotoxicity due to membrane damage from surfactants is well known and was not controlled for, the results cannot be fully attributed to glyphosate technical

but may be related to the surfactants, no statistical analysis was performed, variation within the datasets were not reported (despite each experiment being conducted in triplicate) and there was an inadequate level of data reporting. Therefore, both EFSA and the OCS concluded that neither of the studies were suitable for regulatory purposes.

Monroy et al. (2005) reported a concentration-related increase in DNA migration in both normal human GM38 cells and human fibrosarcoma (HT1080) cells, which were statistically significant between 4 and 6.5 mM glyphosate and 4.75 and 6.5 mM glyphosate, respectively. At the highest dose (6.5 mM), DNA damage was approximately 5% and 30% for GM38 and HT1080 cells, respectively. Therefore, the authors concluded that glyphosate induces single-strand DNA breaks in mammalian cells. However, the EFSA RAR and OCS both identified a number of deficiencies in study design and reporting. The EFSA RAR (2015) suggested that the positive results seen may be secondary to cytotoxicity and the concentrations used may be at the threshold for cytotoxicity. When the cytotoxicity and genotoxicity results are combined, significant cytotoxicity (as defined by the authors as < 80% cell viability) was evident at 4.75 mM in HT1080 cells, at which genotoxicity results should therefore no longer be considered reliable. No negative control DNA migration results were reported for the HT1080 cells.
At concentrations at and below 5.5 mM, there was no significant change in the length of migration. The percentage of DNA that was not damaged remained higher than the 'DNA damage' scores combined until 5.5 mM.
In combination, these results suggest a lack of genotoxic potential at non-cytotoxic concentrations (4.75 mM).
For the GM38 cells, 80% of cells were viable at the highest concentration (6.5 mM) tested. Therefore, the data that reported significant DNA migration for the GM38 cells appear reliable. The DNA migration data support the DNA morphology data, with the percentage of cells with no DNA damage only remaining higher than the DNA damage combined up to 4 mM. Therefore, the OCS concluded that the results for HT1080 cells were not reliable for regulatory purposes and that the results for GM38 cells are reliable as supporting evidence only, due to a number of study design and reporting limitations.

One study utilised the SCE assay to assess genotoxicity in human lymphocytes, which was also considered by EFSA. Bolognesi et al. (1997) reported both glyphosate technical (purity not specified) and a glyphosate-based formulation induced a concentration-related increase in SCEs from 1 to 6 mg/mL and 0.1 to 0.33 mg/mL, respectively, and that a larger effect occurred with the formulated product than glyphosate technical. However, the EFSA and OCS identified a number of critical deficiencies in study design and reporting, including deviations from OECD guidelines: the experiment was conducted only in the absence of an exogenous source of metabolic activation; positive controls were not included and therefore the validity of the test system was not confirmed; only pooled data were provided (precluding assessment of the influence of inter-individual variation) and only two subjects were included, which does not allow a meaningful statistical analysis). Therefore, both EFSA and OCS concluded that the study was not reliable for regulatory purposes.

Bolognesi et al. (1997) investigated the potential for glyphosate (300 mg/kg) or Roundup® (900 mg/kg) to induce single-strand DNA breaks following ip administration, using the alkaline elution assay. EFSA concluded that the positive results of this assay may be secondary to cytotoxicity, as the doses of glyphosate were close to or in excess of the ip LD50 of glyphosate in mice. The OCS agreed with this assessment and concluded that the results of the alkaline elution assay are not reliable for regulatory purposes.

GENE MUTATION AND CHROMOSOMAL DAMAGE

Chromosomal effects, such as induction of chromosomal aberrations or micronuclei in cultured mammalian cells are considered direct measures of genotoxicity. Five studies assessed genotoxicity of glyphosate using the *in vivo*

micronucleus assay in various strains of mice, while one utilised the *in vitro* micronucleus assay in human lymphocytes. Significantly increased micronuclei, nuclear buds and nucleoplasmic bridges were reported following glyphosate treatment in the presence of metabolic activation at the highest concentration tested (580 µg/mL glyphosate) in human lymphocytes, but not at concentrations likely to be encountered by humans (Mladinic et al. 2009b). However, both the OCS and EFSA concluded that this study was not suitable for regulatory purposes: positive and negative control results were virtually indistinguishable, negative control data were not reported and despite the authors' claims that the concentrations of glyphosate tested correspond to acceptable safety levels based on evaluated *in vitro* endpoints, these findings need to be validated *in vivo*.

Four of the five reported *in vivo* micronucleus assays (Rank et al. 1993; Bolognesi et al. 1997; Manas et al. 2009; Prasad et al. 2009) utilised the ip administration route, which is not considered relevant for human exposure. Only one *in vivo* study (Chan & Mahler 1992) utilised a more appropriate dietary exposure model. A small but significant increase in micronucleus frequency was observed in male CD-1 mice, following ip exposure (two injections at a 24 hourly interval) to either 300 mg/kg glyphosate technical or 450 mg/kg Roundup® (equivalent of approximately 135 mg/kg glyphosate) (Bolognesi et al. 1997). However, positive controls were not used to validate the assay and the assay was not conducted according to international test guidelines, which specify that a minimum of three doses of the test substance be assessed in order to determine whether a dose-response relationship exists. In Balb-C mice, a significant increase in micronucleated erythrocytes was observed at high concentrations of glyphosate only (400 mg/kg) (Manas et al. 2009); however, this study was criticised by both EFSA and the OCS for major deviations from international test guidelines. In particular, erythrocytes (instead of immature, polychromatic erythrocytes) were scored for micronuclei and it did not appear that scoring was blinded. In Swiss albino mice, it was reported that glyphosate induced a significant dose- and time-dependent increase in bone marrow micronucleated polychromatic erythrocytes (Prasad et al. 2009). Again, this study was criticised by both EFSA and the OCS as the use of dimethyl sulphoxide (DMSO) as a solvent is highly unusual (glyphosate is soluble in water) and ip administration of DMSO has been shown to enhance the toxicity of glyphosate-based formulations. In contrast, no increase in micronucleus frequency was observed following dietary exposure in B6C3F1 mice (Chan & Mahler 1992) or ip exposure in NMRI-Bom mice (Rank et al. 1993). Positive control animals were treated for only 4 weeks (compared with 13 weeks for treated animals) in the dietary exposure study (Chan & Mahler 1992); therefore, the OCS concluded that the results were reliable only as supportive data for regulatory purposes. The other studies were not considered reliable for regulatory purposes, due to the limitations described above.

By applying centromere probes, Mladinic et al. (2009a) analysed micronuclei and nuclear instability in human lymphocytes exposed to glyphosate, with and without metabolic activation. The authors reported a significant increase in the proportion of micronuclei that contained centromeres only at the highest concentration of glyphosate tested (580 µg/mL) with metabolic activation, which the authors suggested could indicate aneugenic activity that is exhibited only above a threshold concentration. The number of early apoptotic and necrotic cells were significantly increased at 580 µg/mL, with and without metabolic activation. The authors concluded that glyphosate technical is not genotoxic at concentrations relevant to human exposure. The OCS agreed with the authors' conclusion and with EFSA's conclusion that the results are reliable as supporting evidence for regulatory purposes. Furthermore, the OCS agrees with EFSA that the positive results obtained at the highest dose tested indicated a possible threshold aneugenic effect associated with cytotoxicity, rather than a DNA-reactive clastogenic effect.

Three studies assessed genotoxicity using chromosome aberration studies in bone marrow cells obtained from Swiss albino mice (Prasad et al. 2009), SD mice (Li & Long 1988) and human lymphocytes (Manas et al. 2009).

The authors reported that glyphosate induced a significant dose- and time-dependent increase in aberrant cells compared with untreated cells in Swiss albino mouse bone marrow cells (Prasad et al. 2009), but not SD mice (Li & Long 1988) or human lymphocytes even at very high concentrations (up to 6 mM glyphosate) (Manas et al. 2009). However, as described above, the study by Prasad et al. (2009) was not considered suitable for regulatory purposes, as DMSO was used as the solvent (instead of water) and the glyphosate/DMSO solution was administered via ip injection. Li & Long (1988) deviated from international guidelines by testing only one concentration of glyphosate, examining only 50 cells per animal for aberrations and by administering glyphosate by ip injection. Manas et al. (2009) deviated from international guidelines by scoring 100 cells per treatment (instead of 200 cells), not reporting replicate data and not concurrently assessing cytotoxicity.

In addition to the chromosome aberration assay, Li & Long (1988) utilised a variety of other methods to assess genotoxicity, including prokaryotic genotoxicity tests (*Salmonella*/histidine plate incorporation reversion assay, *E. coli* WP2 reverse mutation assay, *B. subtilis* Rec-assay) and *in vitro* mammalian genotoxicity tests (Chinese hamster ovary hypoxanthine-guanine phosphoribosyl transferase or CHO-HGPRT gene mutation assay, unscheduled DNA synthesis). No positive responses were reported in any of the tests performed and the authors concluded that glyphosate is not genotoxic. Despite some deviations from international guidelines (only one positive control used and duplicate (rather than triplicate) plating was used in the *Salmonella*/histidine reversion assay and *E. coli* WP2 reverse mutation assay), the OCS and EFSA both concluded that the negative genotoxicity results of Li & Long (1988) were acceptable for regulatory purposes. Rank et al. (1993) also utilised the *Salmonella* plate incorporation reversion assay to assess genotoxicity; however, only Roundup® was tested and only two of the five recommended bacterial strains were used. The authors reported a weak mutagenic effect at 360 µg/plate in one strain (TA98) without metabolic activation and at 720 µg/plate in another strain (TA100) with metabolic activation. However, EFSA concluded that a reliable assessment was not possible due to marked cytotoxicity at and above 360 µg/plate and the lack of a concentration-response relationship. The OCS agreed with EFSA's assessment and concluded that the results were not reliable for regulatory purposes.

Overall, the OCS concluded that the weight-of-evidence indicates that glyphosate is not genotoxic in mammals at concentrations relevant to human exposure.

Oxidative stress

Overall, seven studies assessed the potential for glyphosate to induce oxidative stress. Oxidative stress is an imbalance between the production of reactive oxygen species (ROS) and their elimination. ROS are important for cell signalling and cycling and are normally physiologically-controlled to prevent cell damage.

Three studies assessed ROS production in response to in vitro treatment of human HepG2 cells with glyphosate (Chaufan et al. 2014), keratinocytes (HaCaT) (Elie-Caille et al. 2010) and erythrocytes (Kwiatkowska et al. 2014). In human HepG2 cells, a significant increase in ROS formation was observed in cells treated with a glyphosate-based formulation (140% of control), but not glyphosate technical or the glyphosate metabolite, AMPA (Chaufan et al. 2014). However, the OCS concluded that this study was of limited regulatory value, as: the product assessed is not registered for use in Australia; the concentration of glyphosate in the formulated product was unclear and cytotoxicity was higher than that observed for glyphosate technical. In addition, the LC_{50} for the formulation was used in the experiments on ROS formation, while the LC_{20} was used for the other treatments. In human keratinocytes, hydrogen peroxide (H_2O_2) was increased in cells treated with 50 mM glyphosate for 30 minutes (Elie-Caille et al. 2010). The concentrations of glyphosate used in this study were very high (between 10 and 70 mM). As the experiments were performed at the IC_{50}, cell responses due to osmotic stress rather than

glyphosate toxicity cannot be excluded. Furthermore, the EFSA RAR noted that the conclusion that treatment with glyphosate (50 mM) for 30 minutes resulted in overproduction of H_2O_2 was based on a qualitatively thicker and more intense fluorescent area in the cell cytosol, but no quantitative measurement was obtained. The OCS added that light microscopy images of the cells were not included. In human erythrocytes, significantly increased ROS production was observed following exposure to glyphosate, its metabolites and impurities at concentrations up to 5 mM (Kwiatkowska et al. 2014). However, the results were provided graphically without actual data, hence it is not possible to independently evaluate these results. Furthermore, no positive controls were tested, therefore the validity of the assays cannot be ascertained.

Chaufan et al. (2014) also investigated the enzymatic (catalase, CAT; glutathione-S-transferase, GST; superoxide dismutase, SOD) and non-enzymatic antioxidant activity (glutathione equivalents, GSH) in human HepG2 cells *in vitro* following exposure to either glyphosate, AMPA or a glyphosate-based formulation. Exposure to glyphosate did not increase the activity of any of the antioxidants evaluated. Exposure to a glyphosate-based formulation caused a significant increase in SOD and GSH activity, while exposure to AMPA also caused a significant increase in GSH. Tyrosine kinases are also important mediators of the cell signalling processes that are involved in various process such as cell proliferation and apoptosis, and have also been implicated in the development of cancer (Paul & Mukhopadhyay 2004). Chaufan et al. (2014) reported that exposure to the glyphosate-based formulation, but not glyphosate or AMPA increased tyrosine nitration compared with controls.

Overall, the OCS concluded that there was limited evidence for an increase in ROS production following exposure to glyphosate, its metabolites or impurities, or a glyphosate-based formulation in *in vitro* cell culture studies using high concentrations of the test substances; however, the weight-of-evidence indicates that exposure to glyphosate at concentrations relevant to human exposure is unlikely to result in increased ROS production in humans.

Caspases participate in the programmed cell death pathway. Some apoptotic cells display caspase 3/7 activity, in contrast to necrotic cells. Two studies investigated caspase activity *in vivo* in male Wistar rats, following ip administration of glyphosate (alone or in combination with other pesticides) (Astiz et al. 2009) and *in vitro* in human HepG2 cells (Chaufan et al. 2014). In rats, ip administration of glyphosate alone did not induce caspase 3 activity in liver or brain (Astiz et al. 2009). However, the sample size was small (n=4), the study was only conducted in males and the administration route (ip injection) is not directly relevant to human exposure scenarios. In human HepG2 cells, caspase 3/7 activity was indirectly measured in cell lysates. Caspase 3/7 activity was significantly increased by a glyphosate-based formulation, but not glyphosate technical. The OCS concluded that oxidative stress and apoptosis may be plausible mechanisms of action for the *in vitro* cytotoxicity of the glyphosate-based formulation; however, the concentrations of treatments were not specified, limiting the value of the study. Furthermore, the product assessed by Chaufan et al. (2014) is not registered for use in Australia, the concentration of glyphosate in the formulated product was unclear and the concentrations of treatments were not specified.

Calpains have also been implicated in apoptosis. In addition to investigating caspase activity, Astiz et al. (2009) also investigated calpain activity *in vivo* in male Wistar rats following exposure to glyphosate alone and in combination with dimethoate and/or zineb. In the liver, milli-calpain activity was not affected by glyphosate alone. In the brain, milli-calpain activity was significantly reduced in both the substantia nigra and cerebral cortex by glyphosate alone. The authors reported that similar data were obtained for μ-calpain activity, but the data were not presented in the publication. While the results presented by Astiz et al. (2009) were considered by IARC to be supportive of an oxidative stress mechanism of action for carcinogenicity by glyphosate, EFSA and the OCS both concluded that the results reported in brain tissue were not biologically plausible for humans, due to the

blood-brain barrier and rapid elimination of glyphosate via urine. Therefore, the OCS concluded that there was no reliable evidence that glyphosate exposure would be likely to increase caspase or calpain activity in humans following exposure via relevant administration routes.

Bolognesi et al. (1997) investigated oxidative stress in Swiss CD-1 male mice (n=3 per dose) following administration of either 300 mg/kg glyphosate technical or 900 mg/kg of Roundup® (~270 mg/kg glyphosate) via ip injection. Glyphosate technical increased 8-OhdG (8-hydroxy-2'-deoxyguanosine)—a marker of oxidative stress—in the liver 24 hours post-treatment, but did not stimulate a response in the kidney. In contrast, Roundup® increased 8-OhdG in the kidney at 8 and 24 hours post treatment, but did not induce a response in the liver. However, as no positive controls were used the validity of the assay cannot be confirmed.

Oxidative potential and impact on DNA was measured in human lymphocytes using Ferric-inducing ability of plasma (FRAP), thiobarbituric acid reactive substances (TBARS) and the human 8-oxoguanine DNA N-glycosylase 1 (hOGG1) modified comet assay (Mladinic et al. 2009a). The authors reported significantly increased oxidative activity (increased frequency of micronuclei, nuclear buds, nucleoplasmic bridges, total antioxidant capacity (FRAP) and lipid peroxidation (TBARS)) at 580 µg/mL glyphosate. These effects were generally greater in the presence of an exogenous source of metabolic activation. However, no clear concentration-dependent effect was observed for any parameter. The number of early apoptotic and necrotic cells were significantly increased at 580 µg/mL, with and without metabolic activation. The authors concluded that glyphosate does not cause oxidative stress at concentrations relevant to human exposure. The OCS agreed with the conclusion by EFSA that as the study was not conducted according to international guidelines, it can only be used as supporting evidence for regulatory purposes and agrees with the authors' conclusions that the lack of a clear dose-response relationship coupled with positive effects only being apparent at the highest concentration of glyphosate tested indicate that glyphosate is not likely to cause oxidative stress at levels relevant to human exposure.

Three studies assessed various aspects of cell morphology and structural integrity *in vitro* in various human cell lines: HepG2 cells (Chaufan et al. 2014), keratinocyte HaCaT cells (Elie-Caille et al. 2010) and erythrocytes (Kwiatkowska et al. 2014). Human HepG2 cells treated with a glyphosate-based formulation exhibited a higher percentage of condensed and fragmented nuclei (23.5%) indicative of apoptotic cell death compared with negative controls, but positive control data was not provided (Chaufan et al. 2014). Although the OCS concluded that the glyphosate-based formulation was likely to be a stimulator of apoptosis, based on the changes in nuclear morphology and increased caspase 3/7 activity *in vitro*, they also concluded that this study was considered to be of limited regulatory value, for the reasons stated above. In human keratinocytes, exposure to glyphosate resulted in shrunken, elongated cells with significantly affected cell adhesion potential, indicative of apoptosis (Elie-Caille et al. 2010). However, the authors cautioned that the cell line used (HaCaT) exhibits possible distinct functional deficiencies compared with normal human keratinocytes and the results cannot be directly extrapolated to *in vivo* keratinocyte behaviour. Furthermore, a two-fold reduction in cell numbers was also observed. The OCS concluded that it was not possible, based on the information provided in the paper, to determine whether glyphosate induced structural cellular changes or whether sub-confluent cells may inherently develop abnormal morphology due to the reduction in cell numbers. In human erythrocytes, glyphosate exposure did not induce morphological changes (Kwiatkowska et al. 2014). In addition, Astiz et al. (2009) investigated the integrity of the inner and outer mitochondrial membranes and peroxidation of mitochondrial membrane lipids *in vivo* in male Wistar rats, again in both liver and brain cells. As the OCS concluded that the results in brain tissue were not biologically plausible in humans, only the results obtained from liver tissue are considered here. Glyphosate alone did not significantly reduce either inner or outer mitochondrial membrane potential and did not affect mitochondrial cardiolipin content in liver (Astiz et al. 2009). Nevertheless, the OCS and EFSA concluded that the study by Astiz et al. (2009) was

not reliable for regulatory purposes. Although the OCS concluded that there was limited evidence that a glyphosate-based formulation may be capable of stimulating apoptosis, there was not sufficient reliable information indicating that glyphosate is involved in apoptosis in humans, at realistic exposure concentrations and administration routes.

Overall, the OCS concluded that no definitive conclusions could be drawn on the ability of glyphosate products and their associated impurities to induce oxidative stress, as there is limited reliable information available regarding the involvement of an oxidative stress mechanism for inducing cytotoxicity.

4.3 Joint FAO/WHO Meeting on Pesticide Residues (JMPR)

The JMPR is an expert scientific body that was established in 1963 and meets annually to scientifically evaluate pesticide residues in food. The JMPR provides expert scientific advice to the Codex Alimentarius Commission and its specialist committee on pesticide residues, the Codex Committee on Pesticide Residues. The Codex Alimentarius develops international food standards and guidelines, with the aim of protecting consumer health, ensuring fair trade practices and promoting coordination of all food standards work undertaken by government and non-government organisations.

There are two expert panels that meet in parallel (hence the term 'Joint Meeting'), the Toxicology Panel (the WHO's Core Assessment Group on pesticides), and the Residues Panel (Organised by the Food and Agricultural Organisation of the United Nations). The Toxicology Panel of the JMPR is responsible for evaluating the adverse effects of pesticides on human health (including carcinogenicity) and establishing health-based guidance values which in turn are important for establishing MRLs used in international trade. The Residues Panel are responsible for evaluating the dietary risks from residues present on food commodities and for setting MRLs. The JMPR is also at the forefront of developing new risk assessment methodologies for pesticides and setting international scientific policy on the interpretation of toxicological studies. Participation in the JMPR is not representational but based on expertise in toxicology and pesticide risk assessment.

The relationship between the WHO, JMPR and IARC

The WHO was established in 1948 to direct and coordinate international health within the UN's system. The IARC is the specialised cancer agency of the WHO, but has its own Governing Council and Scientific Council. While the JMPR also works under the banner of the WHO, its role is to conduct risk assessments for pesticide residues in food, which includes the potential for pesticide residues in food to adversely affect human health in many ways, not just the potential to cause cancer.

The IARC classifies various chemicals, substances and situations in terms of their carcinogenic hazard, which indicates that some level of exposure could increase the risk to cancer. On the basis of this hazard identification and classification process, the JMPR may determine that it is necessary to evaluate or re-evaluate the safety of residues of that chemical in food, following its use in agriculture. Therefore, the two processes are complementary: the IARC determines whether a chemical may potentially cause cancer, while the JMPR determines whether it is likely humans will develop cancer following exposure to realistic residues of that chemical in food.

Assessment process

The process used by JMPR to assess potential risks associated with pesticide residues in food is described in detail in the International Programme on Chemical Safety (IPCS) Environmental Health Criteria 240: Principles and Methods for the Risk Assessment of Chemicals in Food, which is a joint publication of the FAO and WHO. The IPCS has developed definitions of hazard and risk, which are adopted by JMPR for its risk analyses (IPCS 2009):

- hazard—inherent property of an agent or situation having the potential to cause adverse effects when an organism, system or (sub)population is exposed to that agent
- risk—the probability of an adverse effect in an organism, system or (sub)population caused under specified circumstances by exposure to an agent.

Therefore, a risk assessment of food chemicals involves characterising the potential hazards associated with the chemical, as well as the potential risks to life and health resulting from exposure to those chemicals present in food over a specified period of time. This means that as well as looking at the potential for a chemical to cause harm, a risk assessment also considers the probability of that harm occurring as a result of realistic exposure scenarios. A risk assessment conducted by JMPR comprises four steps (IPCS 2009):

- Hazard identification—identification of the type and nature of adverse effects that a chemical is able to cause, taking into account the nature of the health hazard and the circumstances under which a hazard may be expressed.
- Hazard characterisation—assessment of the relationship between the administered dose of or exposure to a chemical and the incidence of the observed adverse health effect, including where possible, a dose-response relationship between increasing dose and health hazard incidence.
- Exposure assessment—evaluation of the exposure of for example, a human to a chemical and its derivatives, taking into account the occurrence and concentrations of the chemical in the diet, consumption patterns of foods containing the chemical, the likelihood of people consuming large amounts of those foods and the likelihood of high concentrations of the chemical being present in those foods. There are usually a range of intake or exposure estimates, which may be broken down by subgroups of the population.
- Risk characterisation—the information from the hazard characterisation and exposure assessment is integrated into suitable advice for risk-based decision making, by providing estimates of the potential risk to human health under various exposure scenarios, as well as the nature, relevance and magnitude of these risks.

The information generated from a risk characterisation may be either qualitative or quantitative, as defined by IPCS (2009) (Table 3). Any areas of uncertainty that result from gaps in the scientific evidence or any information on particularly susceptible subpopulations (eg young children, people with predisposing physiological conditions or people using the chemical as part of their occupation etc.) should be clearly outlined in the risk characterisation.

Table 3: Examples of qualitative and quantitative information outlined by the International Programme on Chemical Safety

Qualitative information	Quantitative information
Statements or evidence that demonstrates an absence	A comparison of dietary exposures with health-based

of toxicity even at high exposure levels	guidance values
Statements or evidence of safety in the context of specified uses	Estimates of risks at different levels of dietary exposure
Recommendations to avoid, minimise or reduce exposure	Risks at minimum and maximum dietary intakes
	Margins of exposure

The IPCS describes the general principles of toxicological study design, which should include compliance with GLP and adherence to internationally recognised organisations that provide guidance for standards of design and conduct of toxicological studies, such as the OECD. The IPCS outlines acceptable study design principles for determining absorption, distribution, metabolism and excretion, as well as general systemic toxicity, acute toxicity, genotoxicity, carcinogenicity, reproductive and developmental toxicity, neurotoxicity, immunotoxicity, food allergies/hypersensitivities and effects on the gastrointestinal tract and gut flora. There are also specific guidelines on designing and conducting studies in humans.

The IPCS goes on to provide guidance on the conduct of dose-response assessments, stating that where there is 'sufficient plausibility' for the presence of a cause-effect relationship, dose-response data are essential (IPCS 2009). Guidance is provided for setting health-based guidance values for substances present in food and drinking water, which are used to quantitate the range of acute or chronic oral exposure that presents no appreciable health risk. The ADI is generally set on the basis of the lowest NOAEL in the most sensitive species; however, a benchmark dose may also be used to determine the ADI. Where appropriate, an ARfD is also developed. Generally, a 100-fold uncertainty factor is used to convert the NOAEL obtained from a study using experimental animals into a health-based guidance value in humans; however, additional uncertainty factors may also be applied in certain circumstances (described by IPCS) (IPCS 2009). The default 100-fold uncertainty factor represents two 10-fold factors that allow for:

- differences between average responses in animals and average responses in humans
- variability in responses between average humans and highly sensitive humans.

Guidance is provided by IPCS on how to perform and interpret acute and chronic dietary exposure assessments for chemicals present in food. This assessment combines data about food consumption patterns with data about the concentration of chemicals in food to provide a dietary exposure estimate, which can be compared with the relevant health-based guidance value available for that chemical. The assessment should include the general population, as well as more vulnerable groups, or people expected to have different exposures from the general public, such as infants, pregnant women etc (IPCS 2009).

Pesticide residue data is evaluated by JMPR according to the IPCS guidelines, using data generated from pesticide use that was conducted according to Good Agricultural Practice, which stipulates that effective pest control be achieved while leaving the smallest residue amount practicable. National legislation stipules MRLs, which are the maximum concentrations of pesticide (or veterinary drug) residues permitted in or on a food.

Importantly, the IPCS provides guidance on how to perform a risk characterisation as a part of the risk assessment process, which integrates the information obtained during the hazard characterisation process and the exposure assessment to provide advice to risk managers (IPCS 2009).

Assessment of glyphosate

Glyphosate has been assessed by JMPR in 2003, 2006 and most recently, in 2011. Following the IARC decision in March 2015 to reclassify glyphosate as 'probably carcinogenic to humans' and noting that new data may have been generated since the JMPR's most previous assessment of glyphosate in 2011, the WHO established an ad hoc expert taskforce to evaluate the available data relating to glyphosate and report its findings to JMPR. The task force completed its assessment of the IARC monograph in September 2015 and recommended that JMPR conduct a full re-evaluation of glyphosate, as the IARC assessment included a number of peer reviewed scientific publications that had not been available during the JMPR's 2011 assessment (WHO 2015).

In October 2015, the WHO issued a data call for a number of substances, including glyphosate. This evaluation of glyphosate was discussed at an extraordinary meeting of the JMPR at WHO headquarters in Geneva, Switzerland on 9 to 13 May 2016. The Meeting summary report was published online in May 2016.

The summary report contained a description of how the Meeting evaluated genotoxicity and epidemiological evidence for the active constituent glyphosate, glyphosate-based formulated products and metabolites (JMPR 2016). The Meeting evaluated a large number of genotoxicity studies that were identified via various means: direct submission to JMPR, searches of publicly available literature, requests to the IARC Monographs Secretariat, or requests to industry groups. The Meeting also searched databases for any relevant articles published after the studies cited in the IARC Monograph, using defined search terms. These studies were either unpublished studies that had been submitted by a sponsor to support an application for registration (the majority of which adhered to internationally accepted guidelines) or peer-reviewed studies published in the scientific literature. The studies were separated into categories that reflected their phylogenetic relevance and the significance of the genetic end-point measured: human biomonitoring studies, *in vivo* mammalian studies, *in vitro* mammalian cell culture models, *in vitro* bacterial models, phylogenetically distant organisms, metabolites *in vivo* and finally, metabolites *in vitro*. Overall, mammalian *in vivo* studies were given more weight than *in vitro* cell culture studies or studies using phylogenetically distant organisms, and studies of gene mutations and chromosomal alterations were given more weight than studies measuring less serious or transient types of genotoxic damage. Studies that measured the effects of oral exposure were considered to be more relevant for determining dietary exposure. Human biomonitoring studies were most likely to be confounded by exposure to other pesticides or other limitations. An overall weight-of-evidence assessment approach was used to reach conclusions about the genotoxicity of glyphosate, based on an evaluation of the studies using the criteria described above as well as an assessment of the overall quality of each study.

The meeting used a pre-agreed evaluation process, as described in the JMPR (2016) Meeting summary, to:

- select glyphosate/cancer site combinations for inclusion in the evaluation
- screen papers for inclusion or exclusion in the evaluation
- evaluate the information for risk assessment.

Glyphosate/cancer site combinations were included if IARC identified positive associations from the evidence it assessed and all studies cited by IARC, published since the IARC assessment was completed or identified from reference lists of already identified papers were screened for inclusion in the evaluation. Papers were included if they were the most recent publication with the longest follow-up period for that glyphosate/cancer site combination and/or the most complete analysis of that glyphosate/cancer site combination with the largest sample size/number

of participants, providing that the exposure assessment was specific to glyphosate and quantitative (ie exposure was expressed on a ratio scale), and that the paper was relevant and could contribute to a quantitative risk assessment for that glyphosate/cancer site combination.

As described in the JMPR (2016) Meeting summary, for each paper that was included in the assessment:

- the quantitative exposure units were determined
- the magnitude of effect or uncertainty was described
- the quality of the study was reviewed
- the exposure assessment was described
- the manner in which exposure levels compared or translated to glyphosate residue levels or pathways was described.

As described in the JMPR (2016) Meeting summary, for each glyphosate/cancer site included in the assessment:

- the hazard from all studies contributing to the quantitative risk assessment was characterised
- the strength-of-evidence was summarised.

When evaluating the evidence for glyphosate/cancer site associations, the Meeting considered factors that would decrease the level of confidence in the body of evidence (including the risk of bias, unexplained inconsistencies and imprecision) as well as factors that would increase the level of confidence in the body of evidence (including a large magnitude of effect, dose-response and consistency) (JMPR 2016). When evaluating the information available for risk assessment and hazard characterisation, the Meeting evaluated the overall evidence for dose-response relationships, by comparing risk estimates with quantitative exposure measures (eg days of use per year) (JMPR 2016).

The Meeting considered prospective cohort studies to be a more powerful study design than case-control studies, as case-control studies are usually retrospective and are therefore more prone to recall and selection biases (JMPR 2016). The one large, prospective cohort study (the AHS cohort) found no evidence of a positive association between glyphosate exposure and NHL incidence. Various case-control studies reported varying results, with some reporting elevated risks (both significant and non-significant) and others not observing an association. The Meeting concluded that there was some evidence of a positive association between glyphosate exposure and the risk of NHL; however, the AHS—a large, high-quality prospective cohort study found no evidence of an association at any exposure level (JMPR 2016).

The Meeting identified nine carcinogenicity studies in mice, two of which were considered to be of insufficient quality for inclusion in the assessment (JMPR 2016). Equivocal evidence of lymphoma induction was apparent in 3/7 studies in male mice and 1/7 studies in female mice at high doses (5000–40 000 ppm or 814–4348 mg/kg bw/day). In contrast, higher doses (up to 50 000 ppm or 7470 mg/kg bw/day) in the remaining three studies did not cause an effect. In 4/7 studies, there was a trend for a marginal increase in induction of kidney adenomas in male mice at the highest dose tested; however, again, higher doses failed to illicit a response.

The Meeting identified 11 combined chronic toxicity and carcinogenicity studies in rats; however, one was considered inadequate for carcinogenicity assessment (short exposure duration of only 12 months) (JMPR 2016).

An increased incidence of various tumours (interstitial cell tumours of the testes, pancreatic islet cell adenoma, thyroid C-cell tumours, skin keratoma) was observed in 1/10 or (in one case) 2/10 studies. However, in all cases, higher doses used in other studies did not illicit a response. The Meeting also reported a lack of dose-response relationship for some tumour types. There was no evidence for spleen or kidney lymphoma induction in any of the studies. Therefore, the Meeting concluded that there was no reliable evidence for treatment-related tumours in rats at doses of up to 32 000 ppm (or 1750 mg/kg bw/day).

The Meeting concluded that glyphosate is not carcinogenic in rats, but was unable to exclude the possibility that glyphosate is carcinogenic in mice at very high doses (JMPR 2016).

The overall weight-of-evidence suggested that oral doses of up to 2000 mg/kg bw/day glyphosate (either alone or in a formulated product) are not associated with genotoxic effects in the majority of studies in mammals. In cell culture models and organisms that are phylogenetically different to humans, DNA damage and chromosomal effects have been observed following exposure to glyphosate. However, these effects have not been replicated in oral *in vivo* mammalian model studies. Therefore, the Meeting concluded that glyphosate is unlikely to be genotoxic at anticipated dietary exposures (JMPR 2016).

The Meeting's overall conclusion relating to the carcinogenic potential of glyphosate was that, the absence of carcinogenic potential in rodents at human-relevant doses and the absence of genotoxicity in mammals following oral exposure, along with the epidemiological evidence from occupational exposure indicated that glyphosate is unlikely to pose a carcinogenic risk to humans via exposure from the diet (JMPR 2016).

The Meeting also concluded that there was no evidence from seven studies in rats that up to 30 000 ppm (or 1983 mg/kg bw/day) glyphosate resulted in reproductive toxicity. There was also no evidence for teratogenicity or developmental toxicity in rats (up to 3500 mg/kg bw/day; four studies) or rabbits (low-incidence fetal effects were observed in 3/7 studies at doses that exceeded maternal toxicity). There was no evidence of endocrine disruption, with a range of *in vitro* and *in vivo* assays demonstrating no interaction with oestrogen or androgen receptor pathways or thyroid pathways. There was no evidence of neurotoxicity in rats (up to 2000 mg/kg bw/day) or immunotoxicity in female mice (up to 500 ppm, or 1448 mg/kg bw/day) (JMPR 2016).

Finally, the Meeting concluded that the extent to which glyphosate adversely effects the microbiota of the human or mammalian GIT is unclear, as this is an emerging area of scientific research. However, the available information on minimum inhibitory concentration values suggest that it is unlikely that dietary glyphosate residues would be capable of adverse effects on normal GIT microbiota function (JMPR 2016).

The Meeting further concluded that the glyphosate metabolite, AMPA, is unlikely to be genotoxic following oral exposure in mammals and there was no evidence for embryo or fetal toxicity. Similarly, two other metabolites, *N*-Acetyl-glyphosate and *N*-Acetyl-AMPA are unlikely to be genotoxic in mammals (JMPR 2016).

4.4 European Food Safety Authority (EFSA)

Assessment process

The European Food Safety Authority requires scientific information that has adhered to OECD guidelines on toxicological testing of chemicals and the EU Test Method Regulation No. 440/2008, which stipulates in detail how the studies must be conducted. By European law, all required studies must be conducted according to the

principles of GLP. Scientific information that does not meet these standards but has been published in peer-reviewed journals are also included in the assessment.

When evaluating the carcinogenic effects of a chemical, the RMS delegated to conduct the assessment must follow the classification criteria outlined in EU Regulation (EC) No 1272/2008 on CLP criteria. The CLP criteria for establishing the level of evidence (eg sufficient, limited evidence etc.) for a carcinogenic effect are similar to those used by IARC; however, additional factors that influence the overall likelihood that a substance may be carcinogenic to humans must be taken into account. The emphasis placed on each individual factor is dependent on the amount and coherence of available evidence. Generally, more complete evidence is required to decrease the level of concern than is required to increase the level of concern. Some examples of factors to be taken into account include:

- tumour type and background incidence
- multi-site responses
- progression of lesions to malignancy
- reduced tumour latency
- whether responses are in single or both sexes
- whether responses are in single or multiple species
- structural similarity of the chemical to another substance for which there is good evidence of carcinogenicity
- routes of exposure
- comparison of absorption, distribution, metabolism and excretion between experimental animals and humans
- the possibility of a confounding effect of excessive toxicity at experimental doses
- mode of action and its relevance for humans, such as cytotoxicity with growth stimulation, mitogenesis, immunosuppression or mutagenicity.

Assessment of glyphosate

Glyphosate is registered for use throughout Europe and the UK and in 2010 was subjected to a re-assessment by the RMS, Germany, as mandated by the EC and coordinated by EFSA (See Section 2.3).

The BfR concluded that glyphosate was 'unlikely to pose a carcinogenic hazard to humans and the evidence does not support classification with regard to its carcinogenic potential' (EFSA 2015).

During the re-evaluation process, the BfR evaluated more than 150 new toxicology studies and re-assessed nearly 300 toxicological studies, as well as considering around 900 scientific publications and reviewing more than 200 in detail. The BfR concluded that the available data do not demonstrate that glyphosate exhibits carcinogenic or mutagenic properties or that it has adverse effects on fertility, reproduction or embryonal/fetal development in laboratory animals. The BfR concluded that there was convincing evidence that the toxicity associated with some glyphosate-containing products was attributable to co-formulants, such as tallowamines used as surfactants.

In July 2015, the BfR was commissioned to review the IARC monograph on the re-classification of glyphosate.

The BfR agreed with the conclusion that there is 'limited evidence in humans for the carcinogenicity of glyphosate' and its assessment of the epidemiological studies was comparable to that of the IARC Working Group. However, the BfR also noted that no consistent positive association between glyphosate exposure and the development of cancer was demonstrated and the most statistically highly-powered study detected no effect. The BfR further noted that it was not possible to differentiate between the effects of glyphosate and the co-formulants from the epidemiology studies discussed in the IACR monograph (Germany 2015).

The BfR disagreed with the conclusion by the IARC Working Group that there is 'sufficient evidence in animals for the carcinogenicity of glyphosate', which was based on a positive trend in the incidence of rare renal tumours, a positive trend for haemangiosarcoma in male mice and increased pancreatic islet-cell adenoma in male rats. The BfR assessed the studies relied on by the IARC Working Group and concluded that the weight-of-evidence suggests that there is no carcinogenic risk related to the use of glyphosate and that no hazard classification for carcinogenicity is warranted according to the CLP criteria (Germany 2015). Three studies conducted in mice reported a significant positive trend for renal tumours following glyphosate exposure, when data were analysed using the Cochran-Armitage test for linear trend; however, the analysis by pair-wise comparisons did not demonstrate a significant difference between the groups and the incidences of tumours were within the historical control range (up to 6% for adenoma and carcinoma combined). Similarly, two studies conducted in mice reported a significant positive trend for haemangiosarcoma following glyphosate exposure, when data were analysed using the Cochran-Armitage test for linear trend; however, analysis by pair-wise comparisons did not demonstrate a significant difference between the groups. Furthermore, the background incidence for haemangiosarcoma in male mice is up to 12%. Two of three studies conducted in mice reported a significant positive trend for malignant lymphoma following glyphosate exposure, when data were analysed using the Cochran-Armitage test for linear trend; however, the analysis by pair-wise comparisons did not demonstrate a significant difference between the groups in all three studies. Again, the incidences of malignant lymphoma were within the historical control range (up to 12%). The BfR determined that a significant difference to the incidence of pancreatic islet cell adenomas in rats occurred in the low dose group only, therefore was considered incidental (ie there was no dose-response effect). Therefore, the BfR concluded that the observed incidences of renal tumours, haemangiosarcoma and malignant lymphoma were spontaneous and not related to glyphosate exposure.

The BfR also disagreed with the IARC's conclusion that there 'is mechanistic evidence for genotoxicity, oxidative stress, inflammation, immunosuppression, receptor-mediated effects, and cell proliferation or death of glyphosate'. The BfR concluded that a weight-of-evidence assessment approach indicates that neither glyphosate nor AMPA induce mutations *in vivo* and no hazard classification for mutagenicity was warranted according to CLP criteria (Germany 2015). It further concluded that the mechanistic and other studies do not provide evidence for a carcinogenic mechanism. Consistently negative results were observed in *in vitro* bacterial assays and mammalian cell gene mutation assays and the majority (all of the GLP-compliant studies) of the *in vitro* chromosomal aberration tests and micronucleus tests were also negative. *In vitro* studies produced negative results for induction of DNA repair but positive results for induction of SCE and DNA strand breaks. *In vivo*, 14 somatic cell tests for induction of chromosomal aberrations or micronuclei were negative even at extremely high intraperitoneal doses and there was no evidence for mutagenic activity in germ cells. Two publications reported significant increases in micronuclei following ip administration; however, in both studies the dose tested was in the range of the ip LD_{50} of glyphosate in mice and one study was fundamentally flawed in design. Two publications reported induction of DNA strand breaks following exposure to very high ip doses or repeated oral doses, which were close to or exceeded the ip LD_{50} of glyphosate in mice; therefore, the observed positive results may be the result of secondary effects of cytotoxicity. However, the BfR noted that no firm conclusions can be drawn with regard to a need for classification according to the CLP criteria, regarding specific glyphosate-based formulations, for which there was some

evidence for *in vivo* mammalian chromosomal damage. The BfR recommended that further genotoxicity studies be conducted according to OECD test guidelines.

The BfR agreed with the IARC Working Group that glyphosate does not appear to exhibit endocrine disrupting properties (Germany 2015).

The BfR agreed with the IARC Working Group that there is some indication of induction of oxidative stress, based on *in vitro* studies using human cells and *in vivo* mammalian studies, particularly in blood plasma, liver, brain and kidney of rats; however, it was not indicative of genotoxic or carcinogenic activity in humans. Furthermore, the majority of this work was conducted using a glyphosate-based formulation rather than glyphosate alone. There was no indication of induction of oxidative stress by AMPA.

While the IARC Working Group concluded that there was 'weak evidence that glyphosate may affect the immune system, both the humoral and cellular response', the BfR concluded that the available data do not indicate that glyphosate or glyphosate formulations adversely affect the immune system (Germany 2015). However, it noted that the small number of available studies had methodological limitations and therefore no robust information was available to conclusively determine the possible immunomodulatory action of glyphosate. The BfR mostly agreed with the reporting of the studies relied on by IARC; however expanded on a number of points. For example, the IARC Working Group concluded that one study demonstrated 'pathological effects of glyphosate on the immune system' in rats (Chan & Mahler 1992). However, the only finding reported was a reduction in absolute/relative thymus weight in male rats at the highest dose of glyphosate tested. The BfR concluded that this reduction in thymus weight in male rats was likely related to non-specific toxicity, as evidenced by a lower weight gain and a lower final bodyweight (18%) in male rats, which was not observed in females.

4.5 The European Chemicals Agency (ECHA)

The ECHA is responsible for managing the harmonised classification (CLH) process for active constituent chemicals within plant protection products in the EU. The CLH is based solely on the hazardous properties (ie toxicity) of the chemical and does not take into account exposure; therefore, the CLH procedure conducted by ECHA is not a risk assessment. In that respect, the CLH procedure undertaken by ECHA is similar to the scope of the IARC assessment process.

As a part of the procedure for the renewal of the glyphosate registration in the EU, Germany submitted a proposal for CLH to ECHA. The ECHA launched a 45 day public consultation of the CLH proposal for glyphosate on 2 June 2016 (deadline for comment 18 July 2016). In addition to the existing CLH (eye irritation and aquatic toxicity), a new classification was proposed (ECHA 2016):

- STOT RE 2: May cause damage to organs through prolonged or repeated exposure.

This proposed classification was based solely on the results obtained from developmental studies conducted in rabbits (which appear to be the most sensitive laboratory animal species), where adverse effects (maternal toxicity; NOAEL = 50 mg/kg bw/day) occurred at doses lower than those occurring in the very large number of studies conducted in mice, rats and dogs over longer durations of exposure. Based on CLP hazard criteria, the NOAEL of 50 mg/kg bw/day is lower than the 28-day guidance value in rats (< 300 mg/kg bw/day) and therefore glyphosate technically qualifies for this statement.

The ECHA concluded that a weight-of-evidence approach indicated that glyphosate is not mutagenic and that no hazard classification for mutagenicity was warranted according to the CLP criteria (ECHA 2016). The ECHA considered that standard mutagenicity tests (eg cytogenetic tests or micronucleus assays) were more reliable and carried greater weight than 'indicator tests' (eg comet assays or DNA damage assessed via sister chromatid exchange or DNA strand breaks). Generally, these indicator tests are regarded as useful follow-up tests for confirmation of positive or equivocal standard *in vitro* test results.

Consistently negative results were obtained from *in vitro* bacterial assays and mammalian cell gene mutation assays. Guideline *in vitro* mammalian chromosome aberration tests and micronucleus tests also produced negative results. In contrast, positive results were reported in *in vitro* indicator tests for SCE and DNA strand breaks. Negative results were reported from 11 *in vivo* micronucleus tests or cytogenetic studies in somatic cells that followed international guidelines, while one study reported a weak positive effect in female mice receiving a very high (likely cytotoxic) dose. Inconsistent results were obtained in a number of published studies that did not adhere to international guidelines and generally tested low doses via the ip route. As for *in vitro* studies, positive results for DNA damage (eg strand breaks) were observed in a number of published indicator tests following high ip or repeated oral (via drinking water) administration, while a study assessing unscheduled DNA synthesis produced negative results. There was no evidence of mutagenic activity in germ cells of mice and rats following oral doses of up to 2000 mg/kg bw.

The ECHA concluded that a weight-of-evidence assessment of epidemiological data and data from long-term studies in both rats and mice indicate that no hazard classification for carcinogenicity was warranted for glyphosate according to the CLP criteria (ECHA 2016). In the discussion relating to carcinogenicity, the ECHA addressed the differing assessments of the available information by IARC and EFSA. The ECHA also noted that glyphosate differed from most other pesticides in that a number of comprehensive and high quality studies are available for nearly all toxicological endpoints.

A total of 5/8 long-term, guideline-compliant studies conducted in mice were considered by ECHA. The ECHA took into account the known very large variability of the incidence of spontaneous malignant lymphoma in both Swiss and CD-1 mice, the consistent lack of any dose-response relationship between tumour incidence and glyphosate exposure and the excessively high concentrations that elicited increased incidences of tumours in some studies and concluded that, overall, there was inconsistent evidence for the occurrence of malignant lymphoma, renal tumours and haemangiosarcoma in males but not females.

The ECHA evaluated a total of 7/11 studies conducted in rats, the majority of which (6/7) were guideline-compliant. The non-guideline study (Lankas 1981) was not considered suitable for regulatory purposes due to study design and reporting limitations. The ECHA took into consideration the consistent lack of statistical significance using pairwise analyses, the consistent lack of any dose-response relationships and the lack of reproducibility across multiple studies and concluded that there was no evidence for an association between glyphosate exposure and pancreatic islet cell adenomas, hepatocellular adenomas, C-cell thyroid adenomas or interstitial testicular tumours.

The ECHA also assessed human data on the potential carcinogenicity of glyphosate noting that the value of this data had limitations for regulatory assessments, as it was exclusively derived from epidemiological studies. Firstly, it is difficult to distinguish between the effects of the active constituent and co-formulants, because humans are never exposed to the active constituent alone. As the co-formulants are not only contained in glyphosate-based products, but are also contained within other formulated products, an assessment of the entire formulated product is not indicative of the safety of the active constituent or glyphosate-based products specifically. Secondly, humans

are exposed to a great number of environmental chemicals, making it difficult to attribute health effects to one specific chemical.

The ECHA described the results of the AHS study that analysed data from approximately 57 000 pesticide applicators. Analysis of this data did not identify an association between glyphosate and various forms of cancer, including leukaemia, melanoma, all lymphohaematopoietic cancers, NHL, or cancer of the lung, prostate, breast, colon, rectum, oral cavity, pancreas, kidney or bladder (De Roos et al. 2005; Blair & Freeman 2009). Some papers relied on by the IARC assessment reported positive associations between glyphosate exposure and NHL; however, this association was based on very small sample populations with low numbers of exposed subjects, relied on reported use (and was therefore susceptible to recall bias) by either primary or secondary (eg relatives) sources and was not statistically significant in one study (Nordstrom et al. 1998; Hardell & Eriksson 1999; McDuffie et al. 2001; De Roos et al. 2003; Hardell & Eriksson 2003; Eriksson et al. 2008). In contrast, the ECHA also described 18 papers that did not identify a risk between glyphosate exposure and various specific cancer types (Alavanja & Bonner 2012): prostate cancer (Alavanja et al. 2003; Band et al. 2011; Koutros et al. 2011), stomach and oesophageal adenocarcinomas (Lee et al. 2004), gliomas (Carreon et al. 2005), breast cancer (Engel et al. 2005; El-Zaemey et al. 2013), childhood cancer (following parental exposure) (Flower et al. 2004), pancreatic cancer (Andreotti et al. 2009), monoclonal gammopathy (Landgren et al. 2009), Hodgkin's lymphoma (Karunanayake et al. 2012), multiple myeloma (Pahwa et al. 2012; Kachuri et al. 2013), NHL (Schinasi & Leon 2014), lymphomas in general (including B cell lymphoma) (Cocco et al. 2013) or soft tissue sarcoma (Pahwa et al. 2011).

The ECHA concluded that, while epidemiological data is of limited value for detecting the carcinogenic potential of a pesticide, the data do not provide convincing evidence for an association between glyphosate exposure in humans and any cancer type and no hazard classification for carcinogenicity is warranted for glyphosate according the CLP criteria (ECHA 2016).

Following the public consultation, any received comments will be provided to the Committee for Risk Assessment (RAC), which will form an opinion on the hazard classes that were open for consultation only. For glyphosate, these include: all health hazards except respiratory sensitisation and aspiration hazard (carcinogenicity, germ cell mutagenicity and reproductive toxicity) and all environmental hazards except ozone layer hazards. In addition, ECHA may request further clarification and contact some of those who commented to discuss specific issues. From there, any opinion of the CLH proposal must be adopted by RAC within 18 months from the receipt of that proposal by ECHA and the 'background document', which contains the CLH report with RAC evaluations inserted will be published on the ECHA website. The ECHA will then forward the RAC opinion to the EC, which will determine whether the CLH is appropriate.

4.6 Health Canada

In 2010, Health Canada's PMRA commenced a re-evaluation of glyphosate in collaboration with the US EPA's re-evaluation of glyphosate. In April 2015, the PMRA published its Proposed Re-evaluation Decision (PRVD2015-01) for glyphosate, as discussed above in Section 2.2. In conducting re-evaluations of registered products, the PMRA utilises data from holders of product registrations, as well as published scientific reports, information from other regulatory agencies and any other information considered relevant to the evaluation. The PMRA evaluation of the available scientific information concluded that there were no unacceptable risks to human health or the

environment as a result of using glyphosate according to the proposed label directions and no additional data were requested.

The re-evaluation report describes how the potential risks to human health are assessed, which is similar to the method employed by the APVMA. The PMRA re-evaluation of glyphosate determined that adverse effects observed in animals occurred at doses more than 100 times higher than levels to which humans are normally exposed when using glyphosate according to label directions. The re-evaluation reported that glyphosate has low acute oral, dermal and inhalational toxicity, does not irritate the skin or cause allergic skin reactions in laboratory animals; however, it was a severe eye irritant.

The PMRA determined that acute dietary exposure represented between 12% and 45% of the ARfD for all of the population subgroups. The chronic dietary exposure estimate for the general population represented 30% of the ADI, with a range of 20% to 70% of the ADI for the various population subgroups. As a result, the PMRA concluded that acute and chronic dietary risks were not of concern when glyphosate is used according to the label directions.

The re-evaluation also assessed residential handler exposure from mixing, loading and applying glyphosate product to residential lawns and turf (primarily dermal) as well as incidental oral exposure of children playing in treated areas. Bystander exposure was estimated for scenarios where people enter non-cropland areas, such as parks or hiking areas that had recently been treated with glyphosate. For all of these assessments, assessed either alone or in combination with background chronic dietary exposure (discussed above), no evidence of health risk was determined. Similarly, the risk estimates associated with mixing, loading and applying glyphosate in an agricultural scenario or re-entering treated agricultural sites did not demonstrate any health risks, based on the current directions for use and agricultural use patterns.

The PMRA re-evaluation report addressed the IARC conclusions, emphasising that a hazard classification is not a health risk assessment. They also stressed that the level of human exposure is the factor that determines the risk and that this was not taken into account in the IARC classification of glyphosate. The PMRA considered the epidemiological information included in the IARC assessment and concluded that the majority lacked adequate characterisation of glyphosate exposure, which limited their suitability for assessing the hazard of glyphosate.

The PMRA concluded that the available *in vitro* and *in vivo* tests demonstrated that glyphosate is not genotoxic in rats or mice and that glyphosate is not carcinogenic in rats. While there was some evidence for a marginal increase in the incidence of ovarian tumours in mice, no dose-response was evident and the increased incidence was only observed at the highest tested doses and historical control data were not available. Therefore, the PMRA concluded that these results were of low concern for human health risk assessment.

Overall, the PMRA concluded that the weight-of-evidence obtained from both acute and chronic animal toxicity studies, genotoxicity assays and epidemiology studies indicates that glyphosate is unlikely to pose a human cancer risk.

4.7 New Zealand Environmental Protection Authority

The New Zealand Environmental Protection Authority commissioned a review of the evidence relating to the carcinogenicity of glyphosate. The scope of the review covered the basis on which the IARC Working Group classified glyphosate as a probable human carcinogen, which involved reviewing the quality of the evidence for

carcinogenicity in humans and animal models, as well as the data used to support mechanistic arguments (Temple 2016).

The review concluded that a possible dose-response relationship in humans could not be evaluated, as the epidemiological evidence did not indicate whether any internal exposure was measured or, if there was, the extent of that exposure. The review also agreed with conclusions by WHO in 2006, which reported that weak, rarely statistically significant associations between glyphosate exposure and lymphopoietic cancers do not generally meet the criteria for determining causal relationships from epidemiology data.

The review discussed each epidemiological study relied on by the IARC Working Group in its assessment that there was 'limited evidence' for carcinogenicity in humans, following exposure to glyphosate, as well as a review conducted by Mink et al. (2012) and the assessment conducted by the BfR for EFSA. As with other assessments, the review placed more weight on the prospective AHS cohort study, which did not identify an association between glyphosate and NHL, or a number of other cancer types, even though exposure was higher than that presented in the case-control studies. The review highlighted the fact that only two of the case-control cohort studies cited by the IARC Working Group reported statistically significant increased ORs at the 95% confidence level (Temple 2016).

The review noted that a small, non-significant increased risk of multiple myeloma was identified in the AHS cohort (De Roos et al. 2005), but described in detail the reassessment of that data, which questioned that result (Temple 2016). This re-assessment argued that the reported elevated risk ratio (RR) for multiple myeloma were not relevant, as they resulted from a restricted data set that (most likely by chance) were not actually representative of the population (Sorahan 2015). That is, a number of cases of multiple myeloma in the group of pesticide applicators who had never used glyphosate were excluded from the original analysis because they did not have data about the use of alcohol, smoking etc. This resulted in a false impression of increased risk in ever users, compared with those who had never used glyphosate. The re-analysis resulted in a RR of 1.1 (Sorahan 2015), compared with the original estimated rate ratio of 2.6, reported by De Roos et al. (2005).

One Swedish case-control study reported an association between glyphosate exposure and cancer risk after more than 10 years of exposure (OR 2.26, 95% CI 1.16–4.4) using 29 exposed cases and 18 unexposed controls (Eriksson et al. 2008) and was considered by the IARC Working Group to be a large study. In contrast, Temple (2016) concluded that 29 cases and 18 controls could not be considered a large study and had limited power to detect an effect. The significant effect reported in this study was only significant using a univariate evaluation and there was the possibility that results could have been confounded by earlier exposure to MCPA (2-methyl-4-chlorophenoxyacetic acid), which is associated with an increased risk of NHL.

The review highlighted that the key studies cited in support of 'sufficient evidence' for carcinogenicity in experimental animals consisted of three studies in mice: a positive trend for increased renal tubule carcinoma in one oral study; a positive trend for increased incidence of haemangiosarcoma in one oral study; and tumour promotion in a skin study. The review also highlighted that the IARC Working Group used different statistical tests (trend analysis) to assess the data in those studies, compared with the original analysis (pairwise comparisons). In the original pairwise comparisons, none of the studies produced positive associations. The IARC Working Group also did not take into account historical incidence data or the presence of a viral infection which may have affected survival rates and lymphoma incidence in one study. In addition, a number of studies that have been used by other regulators (which did not support an association between glyphosate and carcinogenicity) were not considered by the IARC Working Group noting that this is consistent with the scope of IARC. The New Zealand

review concluded that the total database of long-term carcinogenicity bioassays were consistently negative and the positive findings reported by the IARC Working Group are not considered supportive of carcinogenicity by other reputable scientific bodies, therefore the overall weight-of-evidence does not indicate that glyphosate is carcinogenic (Temple 2016).

The review concluded that the studies relied on by the IARC Working Group as 'strong evidence' for genotoxicity and oxidative stress primarily utilised *in vitro* mammalian cell studies, in which mammalian cells are directly exposed to glyphosate (or a formulated product) at high concentrations that are not realistic to *in vivo* exposure in animals or humans. The review highlighted that all studies that followed internationally accepted guidelines produced negative results, while all positive associations were achieved in studies that used unvalidated test methods or species, glyphosate formulations, or high intraperitoneal doses that are widely considered inappropriate for assessing genotoxicity in humans (Temple 2016).

The overall conclusion of the review was that, based on a weight-of-evidence approach that considered the quality and reliability of the available data, glyphosate is unlikely to be genotoxic or carcinogenic to humans and does not require classification as either a carcinogen or a mutagen (Temple 2016).

4.8 Adverse Experience Reporting Program (AERP)

The AERP is a post-registration program that assesses reports of adverse experiences associated with the use of agricultural and veterinary products, when the product has been used according to the approved label instructions.

Between 1996 and 2013, a total of four AERs relating to human safety were submitted to the AERP. All were classified as 'possible' or 'probable' by the AERP. Of the four AERs, one related to skin irritation while the remaining three were reports of eye irritation.

5 ASSESSMENT OUTCOMES

In the Tier 1 assessment, the OCS examined the reference list from the IARC Monograph 112 for glyphosate, which included 264 publisher papers. Following analysis of the study abstracts, 174 references were excluded from requiring further review (Table 6), mostly because the study utilised non-conventional species or methodology for evaluating human toxicity (eg fish). A total of 19 references were considered relevant to the carcinogenicity classification of glyphosate, requiring further in-depth revision (Table 4). The remaining 71 references were considered to require further review to determine their relevance to the carcinogenicity classification (Table 5). The APVMA will rely on international assessments of these papers.

The OCS concluded that, based on the results of the critical appraisal and the limited number of studies reviewed by the OCS in the Tier 2 assessment, there did not appear to be any additional information to indicate that glyphosate poses a carcinogenic risk to humans, on the basis of the following:

- a carcinogenic mechanism of action via genotoxicity or oxidative stress is not evident
- the level of cytotoxicity associated with *in vitro* genotoxicity testing of glyphosate was significant, limiting the ability of *in vitro* tests to determine the genotoxicity potential of glyphosate.

The OCS noted that there is some evidence that *in vitro*, glyphosate-based formulated products are more toxic to cells than glyphosate; however, this effect has not been confirmed *in vivo*. Furthermore, many of the studies exhibited significant methodological limitations, reducing the usefulness of the data.

No definitive conclusions could be drawn on the ability of glyphosate-based formulations to induce oxidative stress as there is limited information regarding the involvement of an oxidative stress mechanism for inducing cytotoxicity.

The OCS concluded that glyphosate was unlikely to pose a carcinogenic or genotoxic risk to humans.

The APVMA evaluated a number of recent assessments of glyphosate conducted by international organisations and regulatory agencies (JMPR, EFSA, ECHA, Health Canada and the NZ Environmental Protection Authority), which considered the publicly available data that was considered in the IARC monograph, as well as other published and unpublished data using a weight-of-evidence approach.

The APVMA agreed with the international assessments of the available epidemiological data that, while epidemiological data is of limited value for detecting carcinogenic potential of a pesticide, the weight-of-evidence does not provide convincing evidence for an association between glyphosate exposure in humans and any cancer type, as there was no consistent pattern of statistical associations that would suggest a causal relationship between glyphosate exposure and the development of cancer in adults or children (total or site-specific).

The APVMA agreed with the international assessments that the weight-of-evidence in experimental animals indicates that glyphosate does not pose a carcinogenic risk at realistic exposure levels, as no consistent dose-response relationship was evident in mice or rats and many of the reported tumours are common age-related tumours in rats and mice.

The APVMA agreed with the international assessments that glyphosate is not likely to be genotoxic, as well-designed *in vitro* tests consistently reported negative results. While some *in vitro* studies reported positive

results for, these were generally observed following very high intraperitoneal doses and most likely a secondary effect of cytotoxicity.

Between 1996 and 2013, a total of four 'possible' or probable' AERs relating to human safety (skin or eye irritation) were submitted to the AERP. The APVMA is confident that the current safety and use directions included on approved labels for products containing glyphosate are sufficient to mitigate these known adverse effects.

6 PROPOSED REGULATORY POSITION

On the basis of the evaluation of the scientific information and assessments, the APVMA concludes that the scientific weight-of-evidence indicates that:

- exposure to glyphosate does not pose a carcinogenic risk to humans
- there is no scientific basis for revising the APVMA's satisfaction that glyphosate or products containing glyphosate:
  - would not be an undue hazard to the safety of people exposed to it during its handling or people using anything containing its residues
  - would not be likely to have an effect that is harmful to human beings
  - would not be likely to have an unintended effect that is harmful to animals, plants or things or to the environment
  - would be effective according to criteria determined by the APVMA by legislative instrument, and
  - would not unduly prejudice trade or commerce between Australia and places outside Australia.
- **there are no scientific grounds for placing glyphosate and products containing glyphosate under formal reconsideration**
- the APVMA will continue to maintain a close focus on any new assessment reports or studies that indicate that any of the above conclusions may need revising.

APPENDIX A – LIST OF KEY STUDIES REFERENCED IN THE IARC MONOGRAPH 112 REQUIRING FURTHER REVIEW BY OCS (TIER 2, PART 1)

The studies referenced in the IARC monograph that the OCS recommended for review are presented below in Table 4. These studies were selected according to the criteria outlined in Section 0 to be assessed in Tier 2, Part 1 of the OCS evaluation to determine whether glyphosate should be placed under formal reconsideration.

Table 4: List of studies relevant to the carcinogenicity classification of glyphosate that require evaluation

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/publication details	Comments	Website
Alvarez-Moya, C, Silva, MR, Valdez Ramírez, CV, Gallardo, DG, Sánchez, RL, Aguirre, AC, & Velasco, AF	2014	genotoxicity	glyphosate isopropylamine	human (lymphocyte cell line)	Comparison of the in vivo and in vitro genotoxicity of glyphosate isopropylamine salt in three different organisms. Genetics and molecular biology, 37(1), 105–10	Comet assay; glyphosate isopropylamine; human lymphocytes; positive results	http://www.scielo.br/scielo.php?pid=S1415-47572014000100016&script=sci_arttext
*Astiz, M, de Alaniz, MJ & Marra, CA	2009a	oxidative stress	glyphosate	rat (unknown strain)	Effect of pesticides on cell survival in liver and brain rat tissues. Ecotoxicology and environmental safety,72(7), 2025–32	Liver and brain rat cell survival; MOA for oxidative stress seen in previous study	http://www.sciencedirect.com/science/article/pii/S0147651309001018
*Bolognesi, C, Bonatti, S, Degan, P, Gallerani, E, Peluso, M, Rabboni, R, Roggieri, P & Abbondandolo, A	1997	genotoxicity	glyphosate and Roundup	swiss CD-1 mice; human (lymphocyte cell line)	Genotoxic activity of glyphosate and its technical formulation Roundup. Journal of Agricultural and food chemistry, 45(5), 1957–62	Uses roundup and glyphosate alone; positive results seen in both	http://pubs.acs.org/doi/abs/10.1021/jf9606518
Chan, P & Mahler, J	1992	genotoxicity	glyphosate	F344/N rats and B6C3F1	NTP technical report on the toxicity studies of Glyphosate (CAS No.	Effects in rats and mice; no mutagenicity in	http://europepmc.org/abstract/med/12209170

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/publication details	Comments	Website
				mice	1071-83-6) Administered In Dosed Feed To F344/N Rats And B6C3F1 Mice. Toxicity report series, 16, 1-D3	salmonella; negative for LLNA	
*Chaufan, G, Coalova, I & Rios de Molina Mdel, C	2014	oxidative stress	glyphosate, AMPA and glyphosate formulation	human (HepG2 cell line)	Glyphosate Commercial Formulation Causes Cytotoxicity, Oxidative Effects, and Apoptosis on Human Cells Differences With its Active Ingredient. International journal of toxicology, 33(1), 29–38	Shows formulation increases ROS and has toxic effects not seen in glyphosate alone	http://ijt.sagepub.com/content/33/1/29.short
*Elie-Caille, C, Heu, C, Guyon, C & Nicod, L	2010	oxidative stress	glyphosate	human keratinocyte (HaCaT cell line)	Morphological damages of a glyphosate-treated human keratinocyte cell line revealed by a micro-to nanoscale microscopic investigation. Cell biology and toxicology, 26(4), 331–39	Shows the timeline of membrane damage and ROS production in human keratinocytes	http://www.ncbi.nlm.nih.gov/pubmed/20043237
*Gasnier, C, Dumont, C, Benachour, N, Clair, E, Chagnon, MC & Seralini, GE	2009	genotoxicity	glyphosate and glyphosate formulations	human (HepG2 cell line)	Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines. Toxicology, 262(3), 184–91	Shows effects are dependent on formulation not glyphosate concentration	http://www.sciencedirect.com/science/article/pii/S0300483X09003047
*Gehin, A, Guillaume, YC, Millet, J, Guyon, C & Nicod, L	2005	oxidative stress	glyphosate and round-up	human keratinocyte (HaCaT cell line)	Vitamins C and E reverse effect of herbicide-induced toxicity on human epidermal cells HaCaT: a biochemometric approach. International	Shows effects are due to formulation; uses human keratinocyte cell	http://www.sciencedirect.com/science/article/pii/S0378517304005733

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/publication details	Comments	Website
					journal of pharmaceutics,288(2), 219–26	line	
Greim, H, Saltmiras, D, Mostert, V & Strupp, C	2015	carcinogenicity/ epidemiology	glyphosate and glyphosate formulations	human, rat, mouse	Evaluation of carcinogenic potential of the herbicide glyphosate, drawing on tumor incidence data from fourteen chronic/carcinogenicity rodent studies. Critical reviews in toxicology, 45(3), 185–208	Shows no carcinogenic effect	http://www.tandfonline.com/doi/abs/10.3109/10408444.2014.1003423#.Vf9hMvk0VcY
JMPR	2006	classification					http://apps.who.int/iris/bitstream/10665/43624/1/9241665203_eng.pdf?ua=1
*Kier, LD & Kirkland, DJ	2013	genotoxicity	glyphosate and glyphosate formulations	in vitro and in vivo	Review of genotoxicity studies of glyphosate and glyphosate-based formulations. Critical reviews in toxicology,43(4), 283–315	Review of genotoxicity tesing for glyphosate and formulations	http://www.ncbi.nlm.nih.gov/pubmed/23480780
*Kwiatkowska, M, Huras, B & Bukowska, B	2014	oxidative stress	glyphosate, glyphosate metabolites and glyphosate impurities	human (erythrocyte cell line)	The effect of metabolites and impurities of glyphosate on human erythrocytes (in vitro). Pesticide biochemistry and physiology, 109, 34–43	Uses human erythrocytes; shows that ROS and damage only occurs at levels seen in acute poisoning	http://www.sciencedirect.com/science/article/pii/S0048357514000200
*Li, AP & Long, TJ	1998	genotoxicity	glyphosate	in vitro and in vivo	An evaluation of the genotoxic potential of glyphosate. Toxicological Sciences, 10(3), 537–46	Multiple genotoxicity tests; shows no genotoxic	http://toxsci.oxfordjournals.org/content/10/3/537.short

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/publication details	Comments	Website
						potential	
*Manas, F, Peralta, L, Raviolo, J, Ovando, HG, Weyers, A, Ugnia, L, Cid, MG, Larripa, I & Gorla, N	2009a	genotoxicity	glyphosate	human (Hep-2 cell line); mouse micronucleus	Genotoxicity of glyphosate assessed by the comet assay and cytogenetic tests. Environmental Toxicology and Pharmacology, 28(1), 37–41	Shows positive genotoxicity results in Hep-2 cells and micronucleus mouse test at 400 mg/kg	http://www.sciencedirect.com/science/article/pii/S1382668909000258
*Mladinic, M, Berend, S, Vrdoljak, AL, Kopjar, N, Radic, B & Zeljezic, D	2009a	genotoxicity	glyphosate	human (lymphocyte cell line)	Evaluation of genome damage and its relation to oxidative stress induced by glyphosate in human lymphocytes in vitro. Environmental and molecular mutagenesis, 50(9), 800–7	Shows no clear dose dependent effect	http://onlinelibrary.wiley.com/doi/10.1002/em.20495/abstract
*Mladinic, M, Perkovic, P & Zeljezic, D	2009b	genotoxicity	glyphosate	human (lymphocyte cell line)	Characterization of chromatin instabilities induced by glyphosate, terbuthylazine and carbofuran using cytome FISH assay. Toxicology letters, 189(2), 130–7	Cytome FISH assay; shows no hazardous effect on DNA at low concentrations	http://www.sciencedirect.com/science/article/pii/S0378427409002616
*Monroy, CM, Cortes, AC, Sicard, DM & de Restrepo, HG	2005	genotoxicity	glyphosate	human (GM38 and fibrosarcoma HT1080 cell lines)	Cytotoxicity and genotoxicity of human cells exposed in vitro to glyphosate.Biomedica, 25 (3), 335–45	Suggests MOA not limited to plants	http://www.scielo.org.co/scielo.php?pid=S0120-41572005000300009&script=sci_arttext&tlng=pt
Prasad, S, Srivastava, S, Singh, M &	2009	genotoxicity	glyphosate	swiss albino mice	Clastogenic effects of glyphosate in bone marrow cells of Swiss albino mice. Journal of toxicology,	Shows positive clastogenic and cytotoxic effects in mouse bone	http://www.hindawi.com/journals/jt/2009/308985/abs/

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/publication details	Comments	Website
Shukla, Y					2009	marrow	
*Rank, J, Jensen, AG, Skov, B, Pedersen, LH & Jensen, K	1993	genotoxicity	glyphosate isopropylamine salt and Roundup	in vitro and in vivo	Genotoxicity testing of the herbicide Roundup and its active ingredient glyphosate isopropylamine using the mouse bone marrow micronucleus test, Salmonella mutagenicity test, and Allium anaphase-telophase test. Mutation Research/Genetic Toxicology, 300(1), 29–36	Shows negative effects for glyphosate in three genotoxicity tests	http://www.sciencedirect.com/science/article/pii/0165121893901362

*Considered by EFSA (2015)

APPENDIX B – LIST OF KEY STUDIES REFERENCED IN THE IARC MONOGRAPH 112 THAT REQUIRE FURTHER REVIEW TO DETERMINE RELEVANCE TO THE CARCINOGENICITY CLASSIFICATION

The studies that were referenced in the IARC monograph that the OCS concluded required further assessment to determine their relevance to the carcinogenicity classification of glyphosate are presented below in Table 5. These studies were selected according to the criteria outlined in Section 0. The APVMA will rely on international assessments of these studies to determine whether glyphosate should be placed under formal reconsideration.

Table 5: List of studies recommended by the OCS for further assessment to determine if relevant to carcinogenicity classification of glyphosate

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/Publication details	Comments	weblink
*Alavanja, MC, Samanic, C, Dosemeci, M, Lubin, J, Tarone, R, Lynch, CF, Knott, C, Thomas, K, Hoppin, JA, Barker, J, Coble, J, Sandler, DP & Blair, A.	2003	Carcinogenicity/ epidemiology	unknown formulation	human	Use of agricultural pesticides and prostate cancer risk in the Agricultural Health Study cohort. American Journal of Epidemiology,157(9), 800–14	No direct reference to glyphosate in abstract, increased risk to 'other pesticides' only seen in subjects with a FHx of prostate cancer	http://aje.oxfordjournals.org/content/157/9/800.short
*Astiz, M, de Alaniz, MJ, & Marra, CA.	2009b	oxidative stress	glyphosate	rat	Antioxidant defense system in rats simultaneously intoxicated with agrochemicals. Environmental toxicology and pharmacology, 28(3), 465–73	Glyphosate administered alone and in combo with other a.i.'s; unclear if results are for combo; in vivo rat model	http://www.sciencedirect.com/science/article/pii/S1382668909001392
Astiz, M, Hurtado de Catalfo, GE., García, MN, Galletti, SM,	2013	oxidative stress	glyphosate	wistar rat	Pesticide-induced decrease in rat testicular steroidogenesis is differentially prevented by	Oxidative stress seen in testicular cells; investigates	http://www.sciencedirect.com/science/article/pii/S0147651313000389

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/Publication details	Comments	weblink
Errecalde, AL, de Alaniz, MJ, & Marra, CA.					lipoate and tocopherol. Ecotoxicology and environmental safety, 91, 129–38	antioxidant treatment after administration; unclear if administered in combo	
Benachour, N, & Séralini, GE.	2009	MOA	Roundup	human (umbilical, embryonic, placental cell lines)	Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells.Chemical research in toxicology, 22(1), 97–105	Uses glyphosate formulations, investigates metabolites	http://pubs.acs.org/doi/abs/10.1021/tx800218n
Benachour, N, Sipahutar, H, Moslemi, S, Gasnier, C, Travert, C, & Séralini, GE.	2007	MOA	Roundup (bioforce)	human (embryonic and placental cell lines)	Time-and dose-dependent effects of roundup on human embryonic and placental cells. Archives of Environmental Contamination and Toxicology,53(1), 126–33	Uses glyphosate formulations, investigates toxicity and endocrine-disruption	http://link.springer.com/article/10.1007/s00244-006-0154-8
*Bolognesi, C, Carrasquilla, G, Volpi, S, Solomon, KR, & Marshall, EJP.	2009	genotoxicity/ epidemiology	glyphosate + cosmo-flux	human	Biomonitoring of genotoxic risk in agricultural workers from five Colombian regions: association to occupational exposure to glyphosate.Journal of Toxicology and Environmental Health, Part A, 72(15-16), 986–97	Columbian aerial spray program; uses formulation as exposure to glyphosate; measurement of binucleated lymphocytes with micronuclei as DNA damage	http://www.tandfonline.com/doi/abs/10.1080/15287390902929741#.Ve0iNfk0VcY
Brewster, DW, Warren, J, & Hopkjns, WE.	1991	metabolism	glyphosate	SD rat	Metabolism of glyphosate in Sprague-Dawley rats: tissue distribution, identification, and	Tissue distribution study, shows no persistence in	http://toxsci.oxfordjournals.org/content/17/1/43.short

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/Publication details	Comments	weblink
					quantitation of glyphosate-derived materials following a single oral dose.Toxicological Sciences, 17(1), 43–51	body after single oral dose	
Brown, LM, Burmeister, LF, Everett, GD, & Blair, A.	1993	carcinogenicity/epidemiology	unknown formulation	human	Pesticide exposures and multiple myeloma in Iowa men. Cancer Causes & Control, 4(2), 153–56	No direct reference to glyphosate or roundup; shows little evidence of association between pesticides and multiple myeloma	http://link.springer.com/article/10.1007/BF00053156
Cattani, D, Cavalli, VLDLO, Rieg, CEH, Domingues, JT, Dal-Cim, T, Tasca, CI, & Zamoner, A.	2014	oxidative stress	Roundup	rat	Mechanisms underlying the neurotoxicity induced by glyphosate-based herbicide in immature rat hippocampus: Involvement of glutamate excitotoxicity. Toxicology, 320, 34–45	Uses formulation; neurotoxic effects on rat hippocampus	http://www.sciencedirect.com/science/article/pii/S0300483X14000493
Çavuşoğlu, K, Yapar, K, Oruç, E, & Yalçın, E.	2011	oxidative stress	Roundup	SA mouse	Protective effect of Ginkgo biloba L. leaf extract against glyphosate toxicity in Swiss albino mice. Journal of medicinal food, 14(10), 1263–72	Uses formulation; ip to mice; studies the effect of Ginkgo against effects seen	http://online.liebertpub.com/doi/abs/10.1089/jmf.2010.0202
Chruscielska, K, Brzezinski, J, Kita, K, Kalhorn, D, Kita, I, Graffstein, B, & Korzeniowski, P.	2000	toxicity			Glyphosate. Evaluation of chronic activity and possible far-reaching effects. Part 1. Studies on chronic toxicity. Pestycydy, 3	Chronic toxicity study review	

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/Publication details	Comments	weblink
Coalova, I, de Molina, MDCR, & Chaufan, G.	2014	oxidative stress	atanor + impacto (adjuvant)	human (Hep-2 cell line)	Influence of the spray adjuvant on the toxicity effects of a glyphosate formulation. Toxicology in Vitro,28(7), 1306–11	Uses formulation and adjuvant on Hep-2 cell line; shows toxicity and ROS	http://www.sciencedirect.com/science/article/pii/S0887233314001295
Cocco, P, Satta, G, Dubois, S, Pili, C, Pilleri, M, Zucca, M, 't Mannetje AM, Becker, N, Benavente, Y, de Sanjose, S, Foretova, L, Staines, A, Maynadie, M, Nieters, A, Brennan, P, Miligi L, Enna, MG & Boffetta, P.	2012	carcinogenicity/epidemiology	unknown formulation	human	Lymphoma risk and occupational exposure to pesticides: results of the Epilymph study. Occupational and environmental medicine, oemed-2012	No direct reference to glyphosate; based on pesticide exposure determined via survey	http://oem.bmj.com/content/early/2012/10/31/oemed-2012-100845.short
Culbreth, ME, Harrill, JA, Freudenrich, TM, Mundy, WR, & Shafer, TJ.	2012	MOA	glyphosate	human; mouse	Comparison of chemical-induced changes in proliferation and apoptosis in human and mouse neuroprogenitor cells. Neurotoxicology, 33 (6), 1499–510	Apoptosis induced by glyphosate, neurodevelopmental study; uses human and mouse neural cells	http://www.sciencedirect.com/science/article/pii/S0161813X12001271
Dennis, LK, Lynch, CF, Sandler, DP, & Alavanja, MC.	2010	carcinogenicity/epidemiology	unknown formulation	human	Pesticide use and cutaneous melanoma in pesticide applicators in the agricultural heath study. Environmental Health Perspectives, 118(6), 812–	Uses formulation; no results relating to glyphosate	http://www.ladep.es/ficheros/documentos/10(35).pdf

Author(s)	Year	Endpoint	Formulation type (if stated)	Species	Title/Publication details	Comments	weblink
					17		
*De Roos, A, Zahm, SH, Cantor, KP, Weisenburger, DD, Holmes, FF, Burmeister, LF, & Blair, A.	2003	carcinogenicity/epidemiology	unknown formulation	human	Integrative assessment of multiple pesticides as risk factors for non-Hodgkin's lymphoma among men.Occupational and Environmental Medicine, 60(9), e11–e11	Uses formulation; shows positive trend with NHL	http://oem.bmj.com/content/60/9/e11.short
*Dimitrov, BD, Gadeva, PG, Benova, DK, & Bineva, MV.	2006	genotoxicity	Roundup	mouse (bone marrow)	Comparative genotoxicity of the herbicides Roundup, Stomp and Reglone in plant and mammalian test systems. Mutagenesis, 21 (6), 375–82	Comparative study using glyphosate formulation; negative results	http://mutage.oxfordjournals.org/content/21/6/375.short
*Engel, LS, Hill, DA, Hoppin, JA, Lubin, JH, Lynch, CF, Pierce, J, Samanic, C, Sandler, DP, Blair, A & Alavanja, MC.	2005	carcinogenicity/epidemiology	unknown formulation	human	Pesticide use and breast cancer risk among farmers' wives in the agricultural health study. American Journal of Epidemiology,161(2), 121–35	Uses formulation; glyphosate not directly referenced in the abstract; no clear association with breast cancer	http://aje.oxfordjournals.org/content/161/2/121.short
*Eriksson, M, Hardell, L, Carlberg, M, & Åkerman, M.	2008	carcinogenicity/epidemiology	unknown formulation	human	Pesticide exposure as risk factor for non-Hodgkin lymphoma including histopathological subgroup analysis. International Journal of Cancer, 123(7), 1657–63	Uses formulation; results were not adjusted for multiple exposures; shows increased risk of NHL for glyphosate	http://onlinelibrary.wiley.com/doi/10.1002/ijc.23589/pdf

*Considered by EFSA (2015)

APPENDIX C – LIST OF KEY STUDIES REFERENCED IN THE IARC MONOGRAPH 112 REVIEWED BY THE EU IN 2013 THAT WERE NOT CONSIDERED BY THE OCS

Table 6 below lists the studies referenced in the IARC Monograph 112 for glyphosate that were not considered to require further evaluation by the OCS, as well as the reasons for exclusion.

Table 6: List of excluded studies based on criteria outlined in Section 4.2

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Abraxis	2005			Plate kit	No	No
Acquavella	2004			Biomonitoring	No	No
Akcha	2012	genotoxicity		Not a relevant human model – oyster	No	No
Alavanja	1996	N/A	Yes	Outline of agricultural health study	No	No
Alvarez-Moya	2011	genotoxicity		Not a relevant human model	No	No
Andreotti	2009	carcinogenicity		No direct reference to glyphosate	No	Yes
Aris	2011			Maternal and fetal exposure to pesticides associated with GM foods	No	No
Band	2011	carcinogenicity		No direct reference to glyphosate, refrence to malathion	No	Yes
Battaglin	2005			Transformation products in streams	No	No
Bernal	2010			Liquid chromatography	No	No
Blair	2011			Exposure misclassification in AHS	No	No
Blakley	1997	immune function		Not relevant to carcinogenicity classification	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Bonini	2006			Oxidation of dye in antioxidant activity assay	No	No
Borggaard	2008			Fate of glyphosate in soil	No	No
Botero-Coy	2013a			Improvements in analytical assay	No	No
Botero-Coy	2013b			Liquid chromatography of glyphosate in rice, maize, soybeans	No	No
Brown	1990	carcinogenicity	Yes	No reference to glyphosate	No	No
Bruch	2013			Leaching assessment programme	No	No
Cantor	1992	carcinogenicity	Yes	No direct reference to glyphosate, reference to malathion	No	No
Carreon	2005	carcinogenicity	Yes	No direct reference to glyphosate	No	Yes
Cattaneo	2011	oxidative stress		Not a relevant human model – fish	No	No
Cavalcante	2008	genotoxicity		Not a relevant human model – fish	No	No
Cavas	2007	genotoxicity		Not a relevant human model – goldfish	No	No
CCM International	2011			Outlook for Chinese glyphosate industry	No	No
Centre de Toxicologie du Quebec	1988			Exposure of forestry workers	No	No
Chandra	1994			Spontaneous renal lesions in strains of mice	No	No
Chang	2011			Fate of glyphosate in the environment	No	No
Chen	2012			DNA damage in cyanobacteria	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Chen	2013			Residues on fruit and vegetables	No	No
Chen	2009			Glyphosate poisoning in Taiwan	No	No
Clair	2012	endocrine disruption		Not relevant to carcinogenicity classification	No	No
Clements	1997	genotoxicity		Not a relevant human model – tadpoles	No	No
ColomboPage News Desk	2014			Media—Sri Lanka lifts ban on sale of glyphosate	No	No
Connors	2004	genotoxicity		Not a relevant human model—mussel	No	No
Costa	2008	oxidative stress		Not a relevant human model—tadpoles	No	No
Curwin	2005			Pesticide contamination inside farm and non-farm homes	No	No
Curwin	2007			Uurinary pesticide conc.	No	No
de Castilhos	2013	genotoxicity		Not a relevant human model—fish	No	No
de Marco	1992			Soil breakdown of glyphosate	No	No
de Menezes	2011	oxidative stress		Not a relevant human model—fish	No	No
de Roos	2005a	carcinogenicity	Yes	Already reviewed by OCS	Yes	Yes
de Roos	2005b	carcinogenicity	Yes	Response to criticism	No	No
de Souza	2013	genotoxicity		Not a relevant human model—fish, used roundup, concluded the results seen could have been due to excipients	No	No
Dill	2010			Glyphosate development, applications and properties	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
dos Santos	2014	genotoxicity		Not a relevant human model—clam, uses atrazine and glyphosate formulation	No	No
Duke	2009			Glyphosate resistant crops	No	No
EC	2002			EU report on glyphosate	No	No
EFSA	2008			Residues report	No	No
el-Gendy	1998	immune response		Not relevant to carcinogenicity classification, not a relevant human model—fish	No	No
US EPA	1980a	teratology		Not relevant to carcinogenicity endpoint	No	No
US EPA	1980b	teratology		Not relevant to carcinogenicity endpoint	No	No
US EPA	1992			Glyphosate in drinking water	No	No
US EPA	1997			Pesticides sales and usage	No	No
US EPA	2015			Tox database	No	No
US EPA	1991c			Peer review of glyphosate	No	No
US EPA	1993a			Glyphosate RED	No	No
US EPA	1993b			Glyphosate RED factsheet	No	No
US EPA	2011			Pesticides sales and usage	No	No
Eustis	1994			Multiple-section histo sampling	No	No
FAO	2000			Review	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Farm Chemicals International	2015			Crop protection database	No	No
Ferreira	2010	oxidative stress		Not a relevant human model—fish	No	No
Forgacs	2012			Model for evaluation of reproductive and developmental toxicants	No	No
Freedonia	2012			Industry forecast	No	No
Frescura	2013			Not a relevant human model—fish, glyphosate used as a positive control	No	No
Geret	2013	genotoxicity		Not a relevant human model—oyster	No	No
Gholami-Seyedkolaei	2013	genotoxicity		Not a relevant human model—fish	No	No
Glusczuk	2011	oxidative stress		Not a relevant human model—fish	No	No
Glyphosate Task Force	2014			Glyphosate use	No	No
Granby	2001			Development of a method to measure glyphosate in cereal	No	No
Guha	2013			Residential pesticide use	No	No
Gui	2012			Neurotoxic effects, parkinsonism	No	No
Guilherme	2010	genotoxicity		Not a relevant human model—eel	No	No
Guilherme	2012a	oxidative stress		Not a relevant human model—fish	No	No
Guilherme	2012b	oxidative stress		Not a relevant human model—fish	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Guilherme	2014a	oxidative stress		Not a relevant human model—fish	No	No
Guilherme	2014b	genotoxicity		Not a relevant human mode—fish	No	No
Hardell	1999	carcinogenicity	Yes	Already reviewed by OCS	Yes	Yes
Hardell	2002	carcinogenicity	Yes	Already reviewed by OCS	Yes	Yes
HaYes	1991			Handbook of pesticide toxicology	No	No
Hidalgo	2004			Liquid chromatographic method in water	No	No
Hilton	2012			Global glyphosate market	No	No
Humphries	2005			Residues in atmosphere, soil and water	No	No
IARC	2006			Data for the monographs	No	No
IARC	2014			Key characteristics of carcinogens	No	No
IPCS	1994			Glyphosate environmental health criteria	No	No
IPCS	1996			Glyphosate data sheet	No	No
IPCS	2005			Glyphosate safety card	No	No
Jacob	1988			Metabolism of glyphosate in pseudomonas	No	No
Jan	2009			Residues measured by spectrophotometric method	No	No
Jauhaianen	1991			Occupational exposure	No	No
Johnson	2005			Occupational exposure	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Kalyanaraman	2012			Measuring reactive oxygen and nitrogen species method	No	No
Kavlock	2012			EPA toxcast program	No	No
Kojima	2004	endocrine disruption		Not relevant to carcinogenicity classification	No	No
Kojima	2010	endocrine disruption		Not relevant to carcinogenicity classification	No	No
Kolpin	2006			Glyphosate and AMPA in US streams	No	No
Kreutz	2011			Not a relevant human model—catfish	No	No
Kuang	2011			Analytical methods for determination of herbicides in food	No	No
Kumar	2014			Not relevant to carcinogenicity classification	No	No
Lavy	1992			Occupational exposure	No	No
Lee	2001			Methods of determination in water	No	No
Lopes	2014			Not relevant to carcinogenicity classification, not a relevant human model—fish	No	No
Lubick	2009			Environmental impact of the cocaine strategy	No	No
Lushchak	2009	oxidative stress		Not a relevant human model—goldfish	No	No
Mahendrakar	2014			Effects and treatment of poisoning	No	No
Malatesta	2008	cytotoxicity		Uses round-up formulation	No	No
Mance	2012			Magazine article, not relevant to carcinogenicity classification	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Mariager	2013			Acute effects, not relevant to carcinogenicity classification	No	No
Marques	2014	genotoxicity		Not a relevant human model—fish	No	No
Marques	2015	genotoxicity		Not a relevant human model—fish	No	No
Maza-Joya	2013	genotoxicity		Not a relevant human model—frogs	No	No
McDuffie	2001	carcinogenicity	Yes	Already reviewed by OCS	Yes	Yes
McQueen	2012			Maternal and prenatal exposure in communities	No	No
Ministry of Chemicals & Fertilizers	2008			Industry performance report	No	No
MLHB	2013			Measurement of glyphosate in human urine samples	No	No
Modesto	2010a	oxidative stress		Not a relevant human model—fish	No	No
Modesto	2010b	oxidative stress		Not a relevant human model—fish	No	No
Mohamed	2011	immune response		Not a relevant human model—freshwater snail	No	No
Moreno	2014	genotoxicity		Not a relevant human model—fish	No	No
Mortensen	2000			Effects and treatment of poisoning	No	No
Motojyuku	2008			Measurement of glyphosate in human serum by GC-MS	No	No
Muangphra	2014	genotoxicity		Not a relevant human model—earthworm	No	No
Nakashima	2002	immune		Not relevant to carcinogenicity classification	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
		response				
NCBI	2015			Open chemistry database	No	No
Nedelkoska	2004			HPLC of glyphosate in water	No	No
Nordstrom	1998	carcinogenicity		Already reviewed by OCS	Yes	No
NPIC	2010			Fact sheet	No	No
Nwani	2013	oxidative stress		Not a relevant human model—fish	No	No
Omran	2013	endocrine disruption		Not relevant for carcinogenicity classification	No	No
Ortiz-Ordonez	2011			Not a relevant human model—fish	No	No
Paganelli	2010	teratology		Not a relevant human model—frogs	No	No
Park	2013			Effects and treatment of poisoning	No	No
Perry	2014			Reporting of exposures to pesticides in the UK	No	No
Pesticides Residues Committee	2007			Pesticide monitoring report	No	No
Pesticides Residues Committee	2008			Pesticide monitoring report	No	No
Pesticides Residues Committee	2010			Pesticide monitoring report	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Piola	2013	toxicity		Not a relevant human model—earthworm	No	No
Poletta	2009	genotoxicity		Not a relevant human model—caiman	No	No
Poletta	2011	genotoxicity		Not a relevant human model—caiman	No	No
Republica de El Salvador	2013			Notice on prohibited pesticides	No	No
Roberts	2010			Effects and treatment of poisoning	No	No
Rueppel	1977			Metabolism of glyphosate in soil and water	No	No
Rumack	2015			Effects and treatment of poisoning	No	No
Sanchis	2012			Glyphosate in groundwater	No	No
Siddiqui	2012	genotoxicity		Not a relevant human model—fenugreek	No	No
Simonsen	2008			Glyphosate and AMPA in soil	No	No
Sinhorin	2014	oxidative stress		Not a relevant human model—fish	No	No
Slaninova	2009	oxidative stress		Not a relevant human model—fish	No	No
Sorensen	1999			Effects and treatment of poisoning	No	No
Sribanditmongkol	2012			Effects and treatment of poisoning	No	No
Stella	2004			Effects and treatment of poisoning	No	No
Szekacs	2012			Book about control of weeds	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
Temple	1992			Effects and treatment of poisoning	No	No
Thongprakaisang	2013	endocrine disruption		Not relevant for carcinogenicity classification	No	No
Tian	2012			Synthetic alternative to glyphosate	No	No
Tice	2013			Human hazard characterisation of chemicals	No	No
Tomlin	2000			Pesticide manual	No	No
Transparency Market Research	2014			Global glyphosate market	No	No
Truta	2011	genotoxicity		Not a relevant human model—barley	No	No
Tu	2001			Weed control handbook	No	No
Uren Webster	2014	reproductive/ developmental		Not a relevant human model—fish	No	No
Vasiluk	2005			Oral bioavailability of glyphosate in vitro	No	No
Vera-Candioti	2013	genotoxicity		Not a relevant human model—fish	No	No
Walsh	2000	reproductive/ developmental		Not relevant to carcinogenicity classification	No	No
Wang	2012	genotoxicity		Not a relevant human model—cyanobacterium	No	No
Wester	1991			Not relevant to carcinogenicity classification, dermal absorption	No	No
Xie	2005	endocrine		Not relevant to carcinogenicity classification, not a relevant human	No	No

Author	Year	Endpoint	Epidemiology study?	Reason for exclusion	Evaluated by	
					OCS	EU (2013)
		disruption		model—fish		
Yadav	2013	genotoxicity		Not a relevant human model—tadpoles	No	No
Yin	2011			Glyphosate use review	No	No
Yoshioka	2011			Measurement of glyphosate by liquid chromatography	No	No
Zahm	1990	carcinogenicity	Yes	2,4-D study	No	No
Zhao	2013	endocrine disruption		Not relevant to carcinogenicity classification	No	No
Zouaoui	2013			Effects and treatment of poisoning	No	No

ABBREVIATIONS

ADI	Acceptable daily intake (for humans)
ADME	Absorption, distribution, metabolism and excretion
AER	Adverse Experience Report
AERP	Adverse Experience Reporting Program
Agvet Code	Agricultural and Veterinary Chemicals Code, Schedule to the *Agricultural and Veterinary Chemicals Code Act 1994*
AHS	Agricultural Health Survey
AMPA	Aminomethylphosphonic acid
APVMA	Australian Pesticides and Veterinary Medicines Authority
ARfD	Acute reference dose
ATDS	Australian Total Diet Survey
BfR	Federal Institute for Risk Assessment
CAT	Catalase
CHO-HGPRT	Chinese Hamster Ovary-Hypoxanthine-Guanine Phosphoribosyl Transferase
CLH	Harmonised classification
CI	Confidence Interval
CLP criteria	Classification, Labelling and Packaging of Substances and Mixtures
DMSO	Dimethyl sulfoxide
DNA	Deoxyribonucleic acid
EC	European Commission
ECHA	European Chemicals Agency
EFSA	European Food Safety Authority
EOS	Earth Open Source
EP	European Parliament
EPSPS	Enzyme 5-enolpyruvylshikimate-3-phosphate synthase
EU	European Union
FAO	Food and Agriculture Organisation

FRAP	Ferric-inducing ability of plasma
FSANZ	Food Standards Australia New Zealand
GLP	Good laboratory practice
GSH	Glutathione
GST	Glutathione-S-transferase
HIV	human immunodeficiency virus
hOGG1	Human 8-oxoguanine DNA N-glycosylase 1
IARC	International Agency for Research on Cancer
IPCS	International Programme on Chemical Safety
JMPR	Joint FAO/WHO Meeting on Pesticide Residues
kg	Kilogram
L	Litre
LD_{50}	Lethal dose
MCPA	2-methyl-4-chlorophenoxyacetic acid
MEPs	Members of the European Parliament
mg/kg bw/day	Milligrams per kilogram of bodyweight per day
mg/L	Milligrams per litre
MRL	Maximum residue limit
NHL	Non-Hodgkin's lymphoma
NHMRC	National Health and Medical Research Centre
NOAEL	No observed adverse effect level
NRA	National Registration Authority
NRS	National Residue Survey
OCS	Office of Chemical Safety
OECD	The Organisation for Economic Co-operation and Development
OECD TGs	OECD Testing guidelines
8-OHdG	8-hydroxy-2'-deoxyguanosine

OR	Odds Ratio
PMRA	Pest Management Regulatory Agency
POEA	Polyethoxylated tallow amine (or polyoxyethylated tallow amine and various synonyms)
RAR	Renewal assessment rapport
RMS	Rapporteur member state
ROS	Reactive oxygen species
RR	Risk ratio
SCE	Sister chromatic exchange
SCGE	single cell gel electrophoresis
SOD	Superoxide dismutase
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TBARS	Thiobarbituric acid reactive substances
TGA	Therapeutic Goods Administration
UK	United Kingdom
US	United States
US EPA	US Environmental Protection Agency
US FDA	US Food and Drug Administration
WHO	World Health Organization

GLOSSARY

Acceptable daily intake	A level of intake of a chemical that can be ingested daily over an entire lifetime without any appreciable risk to health
Acute reference dose	The estimated amount of a substance in food or drinking-water, (expressed on a body weight basis), that can be ingested or absorbed over 24 hours or less, without appreciable health risk
Benchmark dose	A dose of a substance associated with a specified low incidence of risk, generally in the range of 1–10%, of a health effect; the dose associated with a specified measure or change of
Lethal dose	The amount of an ingested substance that kills 50 per cent of a test sample
Maximum residue limit	The highest concentration of a chemical residue that is legally permitted in a food
No observed adverse effect level	Greatest concentration or amount of a substance, found by experiment or observation, which causes no detectable adverse alteration of morphology, functional capacity, growth, development, or lifespan of the target organism under defined conditions of exposure

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TOWN *of* BASSENDEAN

A COUNCILLORS' INFORMATION WORKSHOP IS TO BE HELD ON

WEDNESDAY, 7 DECEMBER 2016

IN THE COUNCIL CHAMBER, 48 OLD PERTH ROAD, BASSENDEAN

COMMENCING AT 7.00PM

AGENDA

Cr Gangell will be the facilitator for this workshop.

1.0 ATTENDANCES & APOLOGIES

2.0 ITEMS TO BE CONSIDERED

EXTRACT FROM AGENDA

2.2 Weed Management (Ref PARE/MAINT/3 – Director Operational Services , Simon Stewert-Dawkins)

APPLICATION

The purpose of the report is to provide Elected Members with information concerning different weed management techniques to generate discussion at the Councillor Workshop

ATTACHMENTS

Attachment No. 2

- 2010 Seventeenth Australasian Weeds Conference
- Weed control methods for Chemical, Flame and Hot Water

BACKGROUND

In November 2016, Council deferred consideration of the following Officer Recommendation for item 10.5 RFT CO 061 2016-17 - Chemical Free (Steam) Weed Management in order to conduct a Councillor Workshop:

"2. Reconsiders its position with respect to the suspension of Glyphosate on hard surfaces given the 30th September 2016 Australian Pesticides and Veterinary Medical Authority ('APVMA') advice that "The APVMA has completed its assessment of the IARC report and other recent assessments of glyphosate and has concluded that glyphosate does not pose a cancer risk to humans"*;*

And, subject to Council considering item 2 and wishing to reinstate glyphosate use on hard surfaces -

3. *Rescinds Council (OCM–12/04/16) resolution to suspend the use of glyphosate on hard surfaces in the urban environment and initiates the use of registered glyphosate products in accordance with the legislative requirements and best management practices in order to control weeds; and*

4. *Requests a further report on the estimated cost to implement a wipe-on glyphosate applicator trial to selected streets to the target weeds growing within the expansion joints of concrete footpaths, road kerbs, road islands and paved pedestrian areas."*

Also in November 2016, Council deferred consideration item 10.6 - Town of Bassendean Glyphosate Usage for Weed Management in order to conduct a Councillors' Information Workshop.

COMMENT

Council may recall that back in September 2011, a Weed Management report was presented to Council for which outlined the non-chemical and chemical (herbicide) weed management practices.

The non-chemical weed management techniques include physical control methods such mechanical weeding, whipper snipping, mowing, hand pulling, hand cutting and stripping.

The Town's Officers have been proactive in their pursuit to find an alternative to glyphosate, and other non-selective chemicals in general. Over the last 3 years, trials have been conducted at Success Hill Reserve using Perlagonic Acid (occurs naturally in plants), Pine Oil and Steam Treatments, all of which have been unsuccessful in the management of weeds.

In April 2016, a report was presented to Council concerning weed management and the opportunity to trial steam treatments at Broadway Reserve and Success Hill Reserve.

Since the report, the Town has been trailing the EMRC steam weed machine at Broadway Reserve and has engaged a contractor "Cape Life" to undertake a trial at Success Hill Reserve.

The steam trail is currently being implemented, however, the results thus far have shown that the steam machine is not a viable substitute for chemical weed control within bushland.
Broadway Reserve was considered in good condition using the Keighery scale for measuring bushland condition prior to trial commencing. The trial to date has shown that steam is not as effective as Glyphosate, the Town's officers were required to organise a Glyphosate treatment in July due to the inundation of weeds within the reserve, this one treatment of Glyphosate effectively eradicated a higher percentage of the weeds than the two steam treatments undertaken prior.

In regards to Success Hill Reserve, 5 steam control treatments have been proposed over 1 financial year with 3 days per treatment. However, prior to steam treatments, Veldt grass weeds had to be manually brush-cut to reduce the vegetative matter and then the remaining weeds steam treated. This method is highly labour intensive, there is a significant increase in pedestrian movement in a fragile bush environment and the Town has found that the steam has not killing the Veldt grass, it has just hindered its growth.

Natural areas are rehabilitated and assessed using the "Keighery Scale for Bush Condition". Annual weed map reports for each of the Town's natural areas demonstrates that all of the natural areas where selective herbicides for target weeds have been used, have shown a reduction in weed coverage and as a result, the condition of bushlands have improved.

In regards to the Success Hill Reserve bushland, where non chemical treatments have been used, unfortunately there has been a progressive increase in weed coverage and the bushland condition has deteriorated.

OTHER NON CHEMICAL WEED MANAGEMENT TECHNIQUES

There are a number of non-chemical weed management practices used in Horticultural and Agricultural practices, however, for Local Government applications, the options are limited.

Attached is a copy of the 2010 Seventeenth Australasian Weeds Conference. Stephen R. Moss presented a paper title "Non-chemical methods of weed control: benefits and limitations".

In the paper, Stephen R. Moss advised that Non Chemical Methods of Weed Control are increasing as a result of fewer herbicides available, due to regulatory actions, and lack of new modes of action and increasing weed resistance. It was identified that that non-chemical control method can give useful levels of weed control.

Stephen R. Moss rated the effectiveness of non-chemical control methods and advised that the non-chemical control methods give, on average, levels of control that are very poor in comparison with herbicides. In addition, this poorer efficacy is not matched by correspondingly lower costs.

Stephen R Ross stated that the reason people are reluctant to use non-chemical methods of weed control in place of herbicides was due to:

- More complex to manage – time constraints;
- Less effective than herbicides;
- Control levels more variable;
- More expensive than herbicides;
- Control levels less predictable;
- No compensation following control failure;
- May not reduce the need for herbicides;
- Little visible evidence of success;
- More risky, to consultant as well as farmer;
- Less return for supplier of herbicides;
- May have adverse environmental effects; and
- Harder manual effort.

The University of Queensland's M Hewitt, K Bullen and D George conducted research into three weed control methods for being; Chemical, Flame and Hot Water. Attached to this report is an abstract of the observations made over an 8 week period.

The three weed control methods compared "Glyphosate" (Chemical- Herbicide) to "Aquatech" Hot water treatment unit with handheld spraydeck and a "Jet4" flamers (LPG fired) hand operated flame applicator for efficacy of weed kill.

The experiment was non–selective (intention was to kill all weeds in the trial). The results from experiment were that Glyphosate proved to be highly effective. For the two alternative thermal treatments, they were more effective when two sequential applications occurred 3-4 weeks apart.

Targeting juvenile plants produced far greater efficacy due to plants having a much higher susceptibility to the intense heat.

The University of Queensland study advised that further testing and investigation into the efficacy of the non –chemical alternative is required to determine their effectiveness in different situations.

A not-for-profit international organisation known as CABI provides information and applies scientific expertise to solve problems in agriculture and the environment. CABI produced a booked titled "Non Chemical Weed Management – Principals, Concepts and Technology" Edited by M.K. Upadhyaha and R.E. Blackshaw.

Chapter 10 of this book provided an overview of the Non Chemical technologies. A summary of the information from this chapter is provided for Council consideration:

***FLAMING WEEDS** (page 158)*

"Flaming kills plants mainly by rupturing of cells which leads to tissue desecration....young seedlings more sensitive to high temperatures."

"Re-growth of old plants following flaming may be reduced or eliminated when flames penetrate the canopy enough to kill auxiliary buds at lower nodes. Which may be protected by surrounding leaves, leaf sheaths and peticoles".

"Moderate flaming may only partially damage plants and their ability to re grow depends on their energy reserves, environmental conditions such as soil moisture, competition from neighbouring plants."

The extent to which flame heat penetrates crop and weed stands, and therefore the efficiency of flame weeding depends on flaming technique, soil structure and the presence of moisture in the leaf surface. Tolerance to heat injury also depends on the protection offered by layers of hair, wax, lignifications, external and internal water status of plant the species re-growth potential. Weed special can be divided into four groups on the basis of the susceptibility to flaming.

1. *The first group consists of species with unprotected growing points and thin leaves. These species can be killed at early seedling status.*

2. *The second group moderately sensitive weeds contains species with relatively heat tolerant leaves or protected growing points. Requires higher dose of fuel to kill weeds.*

3. *The third group consists of weeds with more protected growing points which allow the weeds to re-grow after one flame application. Repeated treatments are needed at later stages due to their ability to re-growth.*

4. *The weeds in the fourth group are very tolerant to flaming because of their creeping growth habit and protected growing points. Perennial weeds with large underground parts also belong to this very tolerant group following a complete shoot kill they re-grow from their below ground meristems. Repeated flamings are needed to control these weeds.*

Flaming technology

Commercial flame weeders use LPG (propane-butane (mixture) as fuel)

Several types of burners have been used for flaming they are commonly grouped according to shape of burner and the flame (flat or tubular). Both covered and open burners have been used for flame weed control. Burners must be set at appropriate angle and height for optimum weed control.

Advantages and disadvantages

Flaming is an attractive weed control option because it leaves no chemical residue in the crop, soil and water. It can control herbicide tolerant or resistant weeds, and it can be used in crops where few or no herbicides are registered.

There are also restrictions for herbicide use in several ground water areas which may increase the interest in flaming and other non-chemical weed control methods.

The disadvantages of flame weeding include the high cost of labour, fuel and equipment. Compared with herbicide application, low selectivity, and lack of residual weed control, making repeated flaming treatments necessary. Flame weeders may have the same capacity as mechanical weed control but are usually slower than chemical weed control.

The working environment involving gas and flames, can be uncomfortable for some operators. From a resource and environmental point of view, the high energy requirement and release of carbon emissions could be seen as disadvantageous.

***HOT WATER** (page 163)*

Unlike non-specific burning and flaming, they (Hot water / Steam) *pose little danger of starting uncontrolled fires. The leaves of the treated plants change colour within a few minutes and the shoots desiccate in a couple of days. Many of the effected weeds may re-generate since the roots are not sufficiently damaged, making repeated applications necessary.*

The extent of injury dependent on weed species, steam temperature, duration of exposure and plant size. Weeds, particularly perennial weeds, regenerated, making repeated exposures necessary.

Short exposure to super heated steam also killed weed seeds, with imbibed (heated steam absorbed) *seeds being generally more susceptible. Seed coatings and other coverings were found to offer protection from steam exposure in some species.*

It should be noted that the current soil steaming technology has two major disadvantages.

The consumption of fossil energy is extremely high with diesel fuel ranging from 3500 to 5000 litres/ha, and secondly, it is time consuming, requiring 70-100 hours to treat 1ha.

ELECTRICAL WEED CONTROL *(page 168)*

In experiments with Lascoe EDS equipment at North Dakota State University, in the early 1980s, electrical weed control trials concluded that electricity has advantages for controlling escaped weeds at low densities but is not suitable as a primary method for weed control at densities of more than 200 weed stems per metre squared. Even at low weed density of 15/m2, electrical weed control requires twice as much energy and takes five times longer than chemical control.

While electrical weed control appears to be an interesting and attractive option... several factors limit its wide commercial use. These include high equipment cost, for and inefficient control of emerging weeds and concern for the operating safety.

ENVIRONMENTAL IMPACTS OF THERMAL WEED CONTROL *(page 172)*

The environmental impacts of thermal control (flaming) and chemical control in agriculture on soil, water, air and energy resources have been studied in Canada. The studies showed that traffic induced soil compaction and unwanted heating of the soil caused by thermal treatments are not important. However, thermal control has greater negative impacts on the air than does chemical control. These impacts are directly relating to the combustion by products (Co and CO2, Nitrous and Sulphur Dioxide) which are important pollutants related to global warming. These impacts are considered more important than those associated with volatiles and spray drift of pesticides. On the other hand, thermal control has no negative impacts on surface and underground water.

However, the energy input in thermal weed control us usually much higher than that of chemical control since thermal methods require great use of fossil fuels.

Conclusion *(page 172)*

With increasing public concern regarding health and the environment, and increasing governmental and consumer pressure to regulate pesticides, many thermal weed control methods have been developed. These include the use of fire, flaming, infrared radiation, hot water, steam, electrical energy, microwave radiation, ultraviolet radiation, lasers, and freezing temperatures. Of these mainly flame weeding, and to some extent infrared radiation, steam, and electrocution have been used commercially. They are mainly used as an alternative to chemical pesticides, e.g. in organic farming and when mechanical methods are not sufficient. Thermal weed control options are attractive because they do not leave chemical residues in the crop, soil and water, and can control herbicide tolerant crops and weeds and provide rapid weed control. However, several thermal methods use much

fossil energy and generally have high equipment costs, slow treatments speeds and do give residual weed control. Some methods also have risk of injury to the operator and risk of fire, which has hindered their application.

The availability of inexpensive herbicides and their availability has hindered research on thermal weed control options. More research is needed in order to develop effective and sustainable thermal methods for weed control.

An alternative is the biological control of weeds. Biological control seeks to find organisms in the weed's native range that are specific to that plant and will not damage native or desirable vegetation. Most often, insects or organisms like fungus or rusts, are likely candidates for bio-control agents. Complete eradication is not a desirable or achievable objective of biological control. The aim is to create an ecological balance between a plant and its natural enemies in the introduced range and to reduce weed density to a level below that at which it causes economic or environmental damage.

In regards to chemical (herbicide) techniques to manage invasive or emerging weeds, the Town applies the herbicide "glyphosate bi-active". It should be noted that the herbicide management of weeds is only undertaken when required in the Town and in accordance to manufacturer's instructions and the Pesticide Operational Policy and Guidelines.

In regards to chemical (herbicide) techniques to manage weeds, the Town applies herbicides in accordance to manufactures instructions and the Pesticide Operational Policy and Guidelines to manage weeds in the following areas:

- Verges – footpath edges and expansion joints;
- Road - between asphalt and kerb lines, road islands;
- Parks – spot spraying; and
- Natural (Bush) areas – spot spray and wicker wipe.

The Town has spoken to the Director of Turfmaster Pty Ltd to ask if they are aware of any organic products or herbicides that could be substituted for Glyphosate that could manage target weeds growing within the expansion joints of concrete footpaths, road kerbs, road islands and paved pedestrian areas.

Turfmaster Pty Ltd advised that while there are organic products available, the APVMA have not register them to treat weeds growing between paved surfaces. Turfmaster Pty Ltd were not able to suggest any other alternative herbicide to treat weeds growing between paved surfaces

The Town had limited to poor results with the organic weed trial at Success Hill Reserve and these products currently available.

As Council is aware from previous reports, the Australian Pesticides and Veterinary Medicines Authority (APVMA) is an independent statutory authority with responsibility for the regulation and administers the National Registration Scheme for Agricultural and Veterinary Chemicals in Australia. Its statutory

powers are provided in the *Agricultural and Veterinary Chemicals Code Act 1994*.

The APVMA released the following statement concerning an assessment of the International Agency for Research on Cancer (IARC):

> *"The APVMA has completed its assessment of the IARC report and other recent assessments of glyphosate and has concluded that glyphosate does not pose a cancer risk to humans"*

In accordance with the manufactures instructions, weed management is only undertaken when required in the Town and in accordance to the Pesticide Operational Policy and Guidelines

FINANCIAL CONSIDERATIONS

Prior to the OCM 12/04/16 resolution which suspended the use of glyphosate on hard surfaces, such as the treatment of expansion joints and edges of all footpaths, road kerbs lines, expansion joints of road islands etc, the following expenditure occurred:

2013/2014	$ 9,553 *
2014/2015	$10,671 *
2015/2016	$10,608 *

**Note that the above historical expenditure figures have been extracted from the Town's financial system, which includes glyphosate treatment to Right of Ways and Public Access Ways. An estimated $2,420 can be subtracted to estimate the hard paved areas only.*

Based on preliminary estimates provided by steam contractors, the 2016/2017 Budget allocated $130,000 to undertake proposed steam treatment for hard surfaces only, however, due to the extent of weeds, the fees submitted were approximately 93% higher and exceed the allocated budget.

The difference between the 2015/2016 expenditure and the steam treatment tender for managing target weeds growing within the expansion joints of concrete footpaths, road kerbs, road islands and paved pedestrian areas, was approximately 2,267% increase from past expenditure or a 2% rate increase.

At the November 2016, Ordinary Council Meeting, it was suggested that a further report be provided on the estimated cost to implement a wipe-on glyphosate applicator trial to selected streets to the target weeds growing within the expansion joints of concrete footpaths, road kerbs, road islands and paved pedestrian areas.

Council resolved not to accept the RFT CO 061 2016-17 - Steam Treatment tender and to conduct a workshop to discuss the APVMA advice, the Town's current weed problems and weeds management issues.

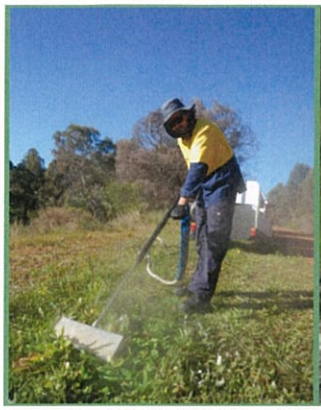
To assist Councillors appreciate how a Steam Machine operates, including the advantages, disadvantages and time required to treat a selection of "summer" weeds such as Catsear (flatweed), Prickly lettuce, Fleabane and Couch Grass growing over the kerb, the Town has booked the EMRC Steam Machine out for a demonstration. The steam demonstration has been scheduled for approximately 5:30pm on Tuesday 6 December 2016, as part of the Councillors' Briefing Session.

Further discussion concerning the winter and summer weed management requirements, the preliminary estimates for traffic management, the preliminary estimates per kilometre for a trial to wet wipe glyphosate on the weeds, preliminary estimates per kilometre rate to cut off the weeds to tidy up the streets and other considerations can be progressed as part of this workshop.

EMRC

GOVERNMENT OF WESTERN AUSTRALIA

natural resource management program



Innovative Weed Control Seminar and Site Tour

A brief guide to alternative weed management including:

- Bus tour and seminar agenda
- Guest speaker biography
- Sites
- Background information
- Case studies

For more information please contact:

environment@emrc.org.au

or via phone (08) 9424 2216

Innovative Weed Control

EMRC

Contents

Innovative Weed Control

EMRC

Agenda

8:45am Registration at the EMRC
An introduction to alternative weed management and case studies

- **Josh Byrne** - Living with weeds - A big picture approach
- **Jeremy Winer** - Steamweed control - Dispelling the myths

Morning tea (EMRC)

Bus tour

Swan Lake, Bayswater

- Conversion to a non-chemical garden

Railway Heritage Trail, Mount Helena

Lunch (Mt Helena)

- Steaming to Success - Alternative weed management trial site
- Steamwand SW900 demonstration
- Scythe demonstration

Spring Reserve, Middle Swan

Blackadder Woodbridge Catchment Group site

- Solarisation demonstration
- Mike Norman's manual hand tool demonstration

4.00pm Return to the EMRC and conclusion

Innovative Weed Control

Guest speakers

Dr Josh Byrne

An introduction to alternative weed management and case studies

Josh is the Western Australian presenter for Gardening Australia. He has a unique and integrated approach to both landscape and broader environmental design and development, which combines his academic background in Environmental Science with nearly 20 years hands on experience as a sustainability practitioner. Josh has extensive experience in community consultation and education and sees this as a key step in achieving sustainable settlements that are responsive to both local environmental conditions as well as the people who interact with them.

Jeremy Winer

Why seeking out alternatives is important and an introduction to steam weeding techniques

Jeremy is the managing director of Weedtechnics, Australia's largest and only specialised non-toxic weeding service provider, focused on helping cities, municipalities, schools, landcare groups, landscape contractors and corporates across Australia to avoid using chemicals to manage weeds.

Innovative Weed Control

Site 1

Swan Lake, Bayswater
Conversion to a non-chemical reserve

Swan Lake is a shallow ornamental lake with sloping reed covered banks surrounded by a mix of native plants, weeping willows and an expanse of lawn. Part of the lake is covered with tall sedges that provide cover and nesting sites for water birds.

Swan Lake is the remnant of an important natural feature which originally spread over a wide area of land including the Bayswater Oval. Draining Swan Lake commenced in 1902 and the current layout was constructed in 1970s and 1980s.

The Lake had suffered from significant algal blooms which prompted the rehabilitation of the site to improve water quality. The site was originally a European style lake with willows and grasses up to the waters edge. The grass was removed around the Lake's edge and replaced with native species, a floating reed bed was installed and following restoration the water quality has significantly improved.

The Friends of Swan Lake volunteer group are an active group who have been instrumental in rehabilitating the Lake to improve water quality. Their revegetation efforts, using native plants, had the added benefit of attracting birds back to the area.

The City of Bayswater deemed the site to be chemical free from 2015. The main methods of weed control are steam and mechanical removal. Non-chemical removal is extremely effective on herbaceous species; however, running grasses continue to be an issue. The City of Bayswater are investigating additional control methods. The community response to the project has been positive with excellent feedback.

Innovative Weed Control

Site 2

Railway Heritage Trail, Mt Helena

Steaming to Success - Alternative Weed Management Trial

The Steaming to Success project is supported by funding from the Western Australian Government's State Natural Resource Management Program.

The aim of the trial is to test the effectiveness of alternative weed control techniques and competitive (dense) planting and mulch. The results of the trial will add to existing knowledge relating to weed control and revegetation techniques.

A site was selected along the Railway Heritage Trial in Mt Helena. Five 3m x 16m plots were marked comprising of one control plot and the other four having the following alternative weed management techniques applied: salt and vinegar; pine oil; pelargonic acid; and steam. Each plot is divided into four 3m x 4m sub-plots to incorporate the competitive planting and mulch. The Steamwand SW700 was used throughout the trial.

Prior to commencing the trial, the site was managed through traditional methods including mowing and chemical spraying along the edge.

The trial started on 1 July 2016 with the initial treatments being applied to all plots excluding the control plot. Mulching and planting were completed two weeks after the initial treatment to meet the specified withholding period. Six treatments were applied in total over winter, spring, summer and autumn. Prior to each treatment monitoring of weeds present and percentage cover was recorded. The last round of monitoring will be conducted in early June 2017 with the final report to be completed in September 2017.

The following information presents the preliminary findings only and is based on initial observations. It should also be noted that the EMRC trial has been carried out in Mt Helena on the Railway Heritage Trail with specific site conditions, and the results may not be transferable to other sites with markedly different conditions.

Alternative weed management trial plots

Control				Salt and vinegar				Pine oil				Pelargonic acid				Steam			
No treat-ment	Plant only	Mulch & plant	Mulch only	Salt & vinegar only	Salt & vinegar & plants	Salt & vinegar & plants	Salt & vinegar & mulch	Pine oil only	Pine oil & plants	Pine oil & mulch & plants	Pine oil & mulch	Pelargonic acid only	Pelargonic acid & plants	Pelargonic acid & mulch &	Pelargonic acid & mulch	Steam only	Steam & plants	Steam mulch & plants	Steam & mulch

Alternative Weed Management Trial
Control Plot

July 2016 before 1st treatment

March 2017 before 5th treatment

To keep consistency across the trial, the control plot received hand-weeding within the native plant wells.

Preliminary findings

The mulched sub-plots within the control plot are comparable to the other treated plots. The main weed present was Plantain. It should be noted that the number of surviving seedlings planted in the control plot, without mulch, was greater than in other non-mulched plots that had treatments. This may be due to the weeds protecting the seedlings by providing shading, frost protection and reducing grazing by rabbits and / or kangaroos.

Time & Resources

Handweeding within the plant wells took between 2-5 minutes per treatment application.

Plantain growing through mulch in between native plants

Mulch suppressed the majority of the weeds, however Plantain was present in between the native plants.

Alternative Weed Management Trial
Salt and Vinegar Plot

July 2016 before 1st treatment

March 2017 before 5th treatment

Preliminary findings

Salt and vinegar (90g/L Acetic Acid, 40g/L Sodium Chloride) was applied to all four sub-plots. Following the initial treatment, mulch was applied and native groundcover planted into two of the four sub-plots. To date, five applications have been carried out at approximately five week intervals. Photo monitoring and weed presence / percentage cover has been recorded in line with other treatments.

Effectiveness

There has been a significant reduction of Flat Weed, Common Storksbill, Staggerweed and Cape Weed with this treatment. After two applications both Flat Weed and Storksbill were reduced by 99% in the non-mulched, non-revegetated sub-plot and 93% and 66% in the non-mulched revegetated sub-plot respectively. Both revegetated and non-revegetated mulched sub-plots had a 100% reduction. Cape Weed had a reduction of 98% in the non-mulched, non-revegetated sub-plot, 99% reduction in revegetated non-mulched sub-plot, and 100% reduction in both revegetated and non-revegetated mulched sub-plots. The positive effect of salt and vinegar solution on controlling Cape Weed is also evident when comparing the Cape Weed percentage cover results against the control plot which remained constant over the same period of time. It should be noted that after the first two treatments the results may have been affected by seasonal variation in the presence / growth of these weeds. The treatment results on weeds, such as Plantain and Perennial Veldt Grass varied. Further treatments will be applied and the results will be discussed in greater detail in the final report.

Time & Resources

The volume of salt and vinegar solution used varied per application. Initial application time was 10-15 minutes per 4 litres, reducing to 2 minutes and 1.5 litres of solution over the course of the trial. Applying the salt and vinegar is relatively similar to traditional herbicide application using a knapsack.

Alternative Weed Management Trial
Pine Oil Plot

July 2016 before 1st treatment

March 2017 before 5th treatment

Preliminary findings

Pine oil was applied to all four sub-plots using a small boom spray mounted to a quad bike. Per OH&S constraints, pine oil cannot be applied with handheld equipment. Following the initial treatment, mulch was applied to two of the four sub-plots. Planting was delayed until the second pine oil treatment was applied and the withholding period was completed. Only two applications were undertaken in line with the manufactures directions stating that: no more than two applications per treatment area should occur within one year. Photo monitoring and weed presence / percentage cover has been recorded in line with other treatments.

Effectiveness

After the second treatment of pine oil, there was a reduction in weed percentage cover of approximately 20%. Weed species such as Flat Weed and Perennial Veldt Grass showed the most significant decrease in cover. Following spring, a new flush of weeds established, due to restrictions on the use of pine oil no further treatment was applied. Despite this, there is still a noticeable difference in weed cover in the pine oil plot compared to the control plot. The restricted method for applying pine oil limits its use in revegetated areas as follow up weed control in between plantings is difficult to achieve. This method could be used to achieve the initial knock-down of weeds before revegetation. Another method for follow up weed control could be used in conjunction with the initial applications of pine oil.

Time & Resources

It takes between 20-30 mins to apply. Boom spray or tractor mounted wiping mechanism is required to apply pine oil.

Alternative Weed Management Trial
Pelargonic Acid Plot

July 2016 before 1st treatment

March 2017 before 5th treatment

Preliminary findings

Pelargonic acid (5%) was applied to all four of the sub-plots while avoiding the native grasses such as Wallaby Grass and *Austrostipa elegantissima* (not present in all plots). Following the initial treatment, mulch was applied and native groundcover planted into two of the sub-plots. There was little impact upon the weeds at the 5% (moderate) rate so after speaking with the manufacturer, the rate was increased to 7% (high) for the remainder of the trial. To date, five applications have been carried out at approximately five week intervals as well as photo monitoring and weed presence / percentage cover observation.

Effectiveness

The initial treatment of 5% was ineffective. The manufacturer advised that 7% pelargonic acid needs to be applied liberally to the leaves, coating them back and front. Establishing the appropriate application rates combined with the seasonal differences in weed species gives inconclusive results of the treatments effectiveness. Variations in application methods, duration of spray and volume of solution applied were noted with different operators. Further applications will be undertaken and results will be included in the final report.

Time & Resources

Applying pelargonic acid requires a precise and careful application method which is markedly different from applying traditional herbicides. This should be considered when contemplating this method of weed control.

Alternative Weed Management Trial
Steam Plot

July 2016 before 1st treatment

March 2017 before 5th treatment

Preliminary findings

Steam was applied to all four of the steam sub-plots while avoiding the native grasses such as Wallaby Grass and *Austrostipa elegantissima* (not present in all sites). Following the initial steaming, mulch was applied and native groundcover planted into two of the sub-plots. To date five applications have been carried out at approximately five week intervals as well as photo monitoring and weed presence / percentage cover observation.

Effectiveness

Steam has been effective on most weeds occurring in the plot with the exception of Plantain. Plantain is capable of re-sprouting after steaming due to its underground energy storage system or tuber. Steam needs to be applied for a longer duration to be effective on Plantain. Some of the weeds that showed a significant reduction in percentage cover using steam include Common Storksbill, Cape Weed, Flat Weed and Hop Clover.

Steaming in between the dense plantings was difficult as the water had a tendency to pool in the plant wells causing the plants to show signs of heat stress. Hand-weeding around the trees in the plots was employed rather than steaming close to the newly planted trees / shrubs.

Time & Resources

Steaming each of the 3m x 4m sub-plots took 5-15 minutes depending on the season. The duration required to steam each sub-plot has reduced by 50-67% over the course of the trial so far. Similar to the other densely planted plots, hand-weeding was undertaken in all of the plant wells where weeds were present.

Alternative Weed Management Trial
Competitive Planting and Mulch

Preliminary findings

Effectiveness

Competitive planting without mulch had a mixed result due to the difficulty to spray or steam around the plants. The photo above shows significant growth of Plantain on the left hand side of the steam and plant sub-plot inhibiting the growth of the seedlings planted. Reasons contributing to this include the compactness and type of soil (ballast). The area steamed was limited due to hot water running off into plant wells and damaging the plants.

The photo below illustrates the benefits of planting into mulch. Mulch increases water retention and suppresses certain weeds reducing competition for water and nutrients. Plantain proved to be quite a tough weed to control and mulch was not able to suppress it. Plantain is a prolific seed producer, it spreads relatively fast invading treated ('managed') plots.

The trial suggests that mulch and competitive planting will significantly benefit a range of weed control techniques and will increase plant survival rates of newly revegetated sites.

Innovative Weed Control

Site 3

Spring Avenue, Middle Swan

Blackadder Woodbridge Catchment Group site visit

Solarisation success demonstration

Blackadder Woodbridge Catchment Group is a progressive volunteer group working to enhance natural bushland, riparian zones and wetlands in the Midland and surrounding area. Since 1997 the group has implemented non-chemical weed control techniques at their sites including solarisation, hand weeding and compost mulching before revegetating with local provenance species. Their methods and sites are often used to demonstrate the success of alternative weed management methods for local education institutions and other interest groups.

The group has published an excellent booklet, 'The Bush is a Garden' a compilation of tried and tested alternative weed management techniques they used for many years. An online copy of the book is available at http://www.emrc.org.au/eastern-region-catchment-management-program.html#garden or if you would like a hard copy of the book, please contact the EMRC at environment@emrc.org.au or phone (08) 9424 2216.

The tour will visit one of the group's sites at Spring Avenue, Middle Swan where the group will show case the excellent results they have achieved using solarisation as a weed management technique The site is located on the corner of Spring Avenue and Lloyd Street and follows a section of the Blackadder Creek. Participants will get the chance to see how the group have used builders plastic in a mosaic pattern since 2010 to remove kikuyu grass followed by revegetation. The group will discuss the benefits of the technique being a low labour, low cost option to utilise in the right situation.

Spring Avenue Ridge 2010

Spring Avenue Ridge 2012

Innovative Weed Control

EMRC

Case Study 1

Friends of Sorrento Beach & Marmion Foreshore
Making manual weeding more effective and efficient

Friends of Sorrento Beach & Marmion Foreshore approach to weeding:

- Aim for 'zero tolerance' of seed shed for the top priority weed species. Aim is to eradicate (not 'manage') most weed species. Some are now eradicated, or close to it.
- Exhaust seed bank over a number of years. Timing is critical.
- Spray ONLY those species that cannot be effectively removed manually.
- Use the best tools available to remove weed species / size appropriate.
- Don't bag weeds if you don't have to (i.e. if no viable seed present) - just scatter the weeds on the site to desiccate.
- Careful manual weeding promotes natural regeneration.

Sorrento Beach, Marmion Foreshore & Porteous Park – 'Working with Nature's Tools'

- Number of weed species manually removed = 25
- Many weed species and litter removed in a single pass, but more than one pass required each year to remove all weed species and multiple germinations.
- Most work done by volunteers during a weekly 2 hour visit, with part-time contractor back-up during 'peak weed season'.
- Spraying by the City of Joondalup staff was done at the start of each section of the project and often this would have been the one and only time. There were a few species that needed follow-up.
- Species sprayed with herbicide include: Sour Sob, Annual Veldt Grass, Couch Grass (in rocky areas), Sea Wheat (wiped), Lachenalia and Vetch.
- When short of resources during peak weed season (spring), the group removed and bagged the seed heads from weeds such as Dune Onion Weed and later used levering tools to remove the plants during summer and autumn.
- The larger spade was also used to pre-lever the ground before planting. Seedling survival rate usually in excess of 90%.

Case Study 2

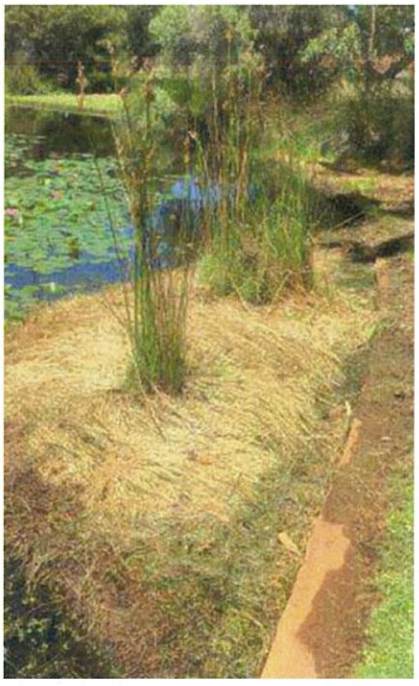
City of South Perth

Steam weeding

City of South Perth purchased a steam weeder machine in 2016 and engaged Syrinx Environmental to undertake a field trial. Results of the field trial are outlined below. City of South Perth continue to use the machine in different settings including wetland and parkland areas.

The steam weeder mounted on a trailer can be operated in moderate off-road situations and can be used on slopes. Start-up procedure is relatively simple taking approximately 10 mins, which is comparable to a traditional spray system involving mixing up herbicide and cycling the lines through the tank. It should be noted that in the traditional system the operation can be started and stopped in a matter of seconds, whereas the steam weeder requires the start-up and shut-down process each time work commences or ceases.

The effects of the steam application are instantaneous, allowing for immediate identification of treated areas and assessment of the effectiveness of treatment. The covered or closed head is suitable for ground covers and certain grasses. It can be placed over a clump for several seconds, then moved or dragged slowly over weeds.



Case Study 2 continued...

City of South Perth

Steam weeding

The cone head can be used to treat areas in and around the base of native vegetation and with careful use has a very low risk of causing collateral damage when compared to herbicide.

When using steam on sandy soil, the pressure of steam and the water runoff resulted in minor erosion. This may not be of concern when treating widely dispersed weeds, but a dense infestation would require significant amounts of water and may cause more serious erosion issues.

When treating areas around lakes / damp areas the weeds like Bucopa seem to come alive 2-3 days after treatment. Also there can be off target damage to surrounding plants, sedges and Centella have been burnt by the steam. In dryland areas the kill rate seems quite high and there is little return of weeds to the treated area. Purslane doesn't seem to respond well, or needs a lot more time applying the steam before it actually dies off.

Generally it is much slower than chemical application, not only the time spent treating but also filling and shut down times. Despite this, the City of South Perth will continue to use the machine and work on improving the methods.

Case Study 3

Scything for weed control

The scythe has had a minor rebirth in some countries in recent years where people wanting to reduce their reliance on petrol-driven motors have found scythes a useful alternative for harvesting crops, mowing hay and keeping down weeds.

Scythes are best adapted to mowing relatively uniform vegetation, crops or pasture, across wide open and flat spaces. In these areas blades ranging from 65cm to 100cm are common.

Shorter and more robust blades between 40cm and 55cm have been developed and may be more useful in tighter areas with heavier, woody weeds.

Example of the scythe used in three main applications at a rural property is shown below. First, the scythe has proven efficient in cutting down Stinkwort and other weeds which grow along the road verge, where the local government has granted an exemption to not apply herbicide.

Second, the scythe is used to take down wild oats at the start of summer as part of fire management in paddocks.

Third, the scythe is used to cut weeds such as Paterson's Curse and Dock before they set seeds. Although weeds can be regarded as part of the soil's process of repair, scything down green weeds and letting the cut material mulch the ground is helping to rebuild lost topsoil.

Case Study 3 continued...

Scything for weed control

Scythe management

The scythe blade is attached to a snath (the long handle), which has two grips or nibs. The blade is held to the snath by a blade ring. Snaths are available in different lengths to suit the height of the mower, though snaths generally allow you to adjust the position of the nibs. Snaths are generally wooden but less commonly made in aluminium or fibreglass.

Keeping the blade sharp and in good condition is critical. Austrian scythes are sharpened in two stages. The equipment to achieve this includes a peening jig (or anvil), hammer, a whetstone and sheath. Most people start out using a peening jig to help keep the peening uniform and even.

Peening, which is a form of cold forging, draws metal from the blade edge to a thin profile. Then the edge of the blade is kept sharp by honing or dressing with a whetstone. The blade is honed every five minutes or so in the field. The stone is kept in a sheath with a small amount of water clipped onto the mower's belt.

Blades need to be hard enough to do the job of scything but soft enough to peen and hone. They have a carbon content of 0.7% to 0.8% which means the blade will rust if not kept dry after use. To take care of the blade it is essential to remove it from the snath after each scything session. Wipe off any grass and ensure the blade is dry and protected. Snaths can be kept in good condition with occasional wipe of unboiled linseed oil.

References and Resources:

http://www.scythesaustralia.com.au/
http://www.scythes.com.au/scythes/
http://scytheconnection.com/
www.kosimesnadno.cz/
The Scythe Book, Mowing Hay, Cutting Weeds, and Harvesting Small Grains with Hand Tools, Second Edition, David Tresemer.
Learn to Scythe, Steve Tomlin.

ATTACHMENT NO. 4

Government of **Western Australia**
Development Assessment Panels

LG Ref: DA 2015-030
DoP Ref: DAP/15/00740
Enquiries: Development Assessment Panels
Telephone: (08) 6551 9919

Mr Carlo Famiano
Urban and Rural Perspectives
PO Box 2507
Malaga WA 6944

Dear Mr Famiano

Metro Central JDAP – Town of Bassendean – DAP Application DA 2015-030
Lot 54 (Nos. 72-74) Railway Parade, Bassendean
14 Multiple Dwellings

Thank you for your application and plans submitted to the Town of Bassendean on 26 February 2015 for the above development at the above mentioned site.

This application was considered by the Metro Central Joint Development Assessment Panel at its meeting held on 23 June 2015, where in accordance with the provisions of the Town of Bassendean Local Planning Scheme No.10, it was resolved to approve the application as per the attached notice of determination.

Should the applicant not be satisfied by this decision, a DAP Form 2 application may be made to amend or cancel this planning approval in accordance with Regulation 17 of the Development Assessment Panel Regulations 2011.

Also be advised that there is a right of review by the State Administrative Tribunal in accordance with Part 14 of the *Planning and Development Act 2005*. An application must be made within 28 days of the determination in accordance with the *State Administrative Tribunal Act 2004*.

Should you have any enquiries in respect to the conditions of approval please contact Mr Christian Buttle at the Town of Bassendean on (08) 9377 8022.

Yours sincerely

Zoe Hendry

DAP Secretariat

1/07/2015

Encl. DAP Determination Notice
Approved plans

Cc: Mr Christian Buttle
Town of Bassendean

Government of **Western Australia**
Development Assessment Panels

Planning and Development Act 2005

Town of Bassendean Local Planning Scheme No.10

Metro Central Joint Development Assessment Panel

Determination on Development Assessment Panel Application for Planning Approval

Location: Lot 54 (Nos. 72-74) Railway Parade, Bassendean
Description of proposed Development: 14 Multiple Dwellings

In accordance with Regulation 8 of the *Development Assessment Panels Regulations 2011*, the above application for planning approval was **granted** on 23 June 2015, subject to the following:

Approve DAP Application reference DAP Dap/15/00740 and accompanying plans:

Dwg No.	Drawing Name	Rev No.	Dwg Date
A0.00	22 Bins Verge Pick Up Plan	3	18.05.2015
A1.01	Proposed Site Development Plan (with aerial underlay)	2	11.05.2015
A1.02	Proposed Site Development Plan	2	11.05.2015
A2.01	Proposed Site / Ground Floor Plan (Part A)	2	11.05.2015
A2.02	Proposed Site / Ground Floor Plan (Part B)	2	11.05.2015
A2.05	First Floor Plan	2	11.05.2015
A3.01	Elevations	2	11.05.2015
A3.02	Elevations	2	11.05.2015

in accordance with Clause 10.3 of the Town of Bassendean Local Planning Scheme No. 10, subject to the following conditions:

1. The design/extent of roof cover to balconies of units 12-19 and 22 being modified in order to facilitate the provision of direct solar access to the Living Room windows of the respective units, to the satisfaction of the Town, unless an alternative arrangement, such as the provision of solar hot water systems along with low water use landscaping for the development, can be provided to the satisfaction of the Town (see footnote).

2. Upper floor unit 19 being set back from the left hand (western) side boundary generally in accordance with the Deemed-to-comply provisions of the R-Codes **or a section of the wall being setback to achieve a light-well between the two bathrooms** and this side of the building being detailed architecturally in a manner which is generally consistent with that of other dwellings within the development, while also allowing for casual surveillance in the manner described within the Officer report (non-major size fixed openings) to the satisfaction of the Town.

3. Outdoor living areas / Balconies for units 5, 19 and 22 being modified in order that a usable area of 10 sq. metres minimum with width and / or length dimensions of 2.4 metres minimum being provided as measured in any direction.

4. The provision of a pedestrian path which provides wheelchair accessibility connecting the main pedestrian entrance to building 'block 4' with the public footpath.

5. A detailed and professionally prepared landscape plan being submitted prior to or with the application for a Building Permit for the Town's approval which provides full detail of the scope of works to be undertaken in both the private and public realms adjoining the development site, including, but not limited to:

   (a) the location, type and size of proposed trees, shrubs and ground cover to be planted; and
   (b) reticulation methods, including arrangements incorporated into the design to minimize water use.

   Landscaping design and species selection shall pay particular attention to provisions contained within the Town of Bassendean Local Planning Policy No. 18 – Landscaping with Local Plants, and shall not include the use of artificial turf.

6. The site shall be landscaped in accordance with the approved landscaping plan and shall be maintained thereafter.

7. Submission of a plan detailing the location of all external lighting, to the satisfaction of the Town prior to or in conjunction with the application for a building permit. The lighting plan shall take particular account of the need to for lighting to be provided to pedestrian paths, car parking areas, bicycle parking locations, and the right-of-way within the vicinity of the pedestrian and vehicular entrance to the development and subsequent lighting installed must demonstrate that any light spill to adjoining properties is minimised to acceptable levels. Lighting in accordance with the approved plan is to be installed prior to occupation or strata titling of the building(s), whichever occurs first.

8. The following works shall be completed within the Railway Parade road reserve to facilitate the proposed development:

   (a) Existing 1m wide concrete apron associated with redundant crossover forward of No. 74 Railway Parade shall be removed and replaced with barrier kerb and brick paving to match the remainder of the footpath;
   (b) Existing Paved crossover forward of No. 74 Railway Parade shall be removed and replaced with paving to match the remainder of the footpath (both in material and paving pattern). This includes the removal of the white header course of paving (which defines the alignment of the existing crossover) and replacement to match the remainder of the footpath;
   (c) The proposed crossover to Railway Parade shall have a 1m concrete apron adjacent to the kerb line. The crossover shall be centrally positioned in line with the access aisle between the visitor car parking spaces and shall be a maximum 6 metre width;

(d) The proposed crossover from Railway Parade shall be constructed of heavy duty trafficable brick pavers, the material and colour of which shall match the adjoining footpath. The crossover shall have a cream coloured header course which delineates the crossover from the adjoining footpath; and

(e) Prior to the issue of a Building Permit, the applicant shall pay the Town a sum of $682 to cover the removal and streetscape contribution associated with the loss of existing vegetation within the Railway Parade road reserve to facilitate bin storage.

9. Prior to the issue of a Building Permit for this development, a 1.0m strip of land shall be excised from the rear of the lot for the purposes of widening the adjoining right-of-way, or the own shall enter into a legal agreement with the Town prepared by the Town's Solicitors at the owner's cost requiring excision of this land to be completed within twelve months of the issue of a Building Permit, or prior to the completion of the development, whichever occurs earlier.

10. The strip of land to the rear of the site which is excised for right-of-way purposes shall be paved, drained and kerbed to the specifications of the Town prior to occupation of the dwellings.

11. The sealing and kerbing of all car parking areas and access ways to the Town's specifications.

12. The on-site car parking spaces and access ways being constructed and maintained thereafter to the Town's satisfaction.

13. Each dwelling being provided with one car parking space. Such arrangement shall be reflected on any subsequent strata plan for the property.

14. Visitor parking spaces being clearly marked for "Visitors Only" and used as such.

15. A minimum of 8 bicycle parking spaces shall be provided for residents, and a minimum of 3 bicycle parking spaces shall be provided for visitors. The resident bicycle parking spaces shall be located in a secure weather protected compound, details of which shall be provided to the Town in advance of, or in conjunction with the application for a building permit, and be constructed in accordance with the provisions of AS 2890.3 (as amended), while visitor bicycle parking spaces shall be relocated close to main pedestrian access points to the development to the satisfaction of the Town as advocated within As2890.3.

16. The width of visitor car parking bay No. 3 shall be increased to 2.4m minimum.

17. The height of filling and associated retaining adjacent to the left hand (western) side property boundary being reduced to an extent that it does not exceed 500mm above existing ground levels.

18. All storm water being contained and disposed of on site. Details of the method of storm water containment and disposal being included with the drawings submitted for a Building Permit.

19. The street number being prominently displayed at the front of the development.

20. The provision of side and rear fences, behind the street setback line, of 1.8 metres in height, unless higher fencing is shown on the approved drawings. Where the ground levels vary on either side of the fence, the required height shall be measured above the higher ground level. Fencing along the common boundary with the adjoining commercial premises at Lot 51 (No. 76) Railway Parade shall be constructed of brick unless otherwise approved by the Town.

21. Any fencing which is situated between a building and the Railway Parade or right-of-way frontages of the development site demonstrating compliance with the following requirements:

    (a) The overall height of fencing not exceeding 1.8 metres above natural ground levels as viewed from outside of the development site; and
    (b) Infill panels above base level solid components which are shown on the approved drawings being visually permeable.

22. External fixtures, including but not restricted to air-conditioning units, satellite dishes and non-standard television aerials, but excluding solar collectors, are to be located such that they are not visible from the street. Prior to the issue of a building permit, details being submitted of all proposed ventilation systems, including the location of plant equipment, vents and air conditioning units for the Town's approval. All equipment must be adequately screened to the satisfaction of the Town.

23. External clothes drying is prohibited on any of the balconies unless screened from view of the street or other public place.

24. Each dwelling shall be provided with an **effective clothes drying facility.**

25. A Waste Management Plan (WMP) is to be submitted for the Town's approval prior to or in conjunction with the application for a Building Permit. The WMP shall address matters including, but not necessarily limited to, the following:

    (a) Measures to be implemented for the purpose of minimising the delivery of waste to landfill during occupation, including: the onsite separation of materials for recycling and the expectations of owners and /or tenants;
    (b) Site Plan showing the location and size of the on-site rubbish disposal area(s), including the number of general rubbish and recycling bins to be provided for the development, including sharing arrangements where the number of bins is less than the number of dwellings;
    (c) An estimation of the volume of waste to be generated by the proposed development and the capacity of this volume of waste to be accommodated by on site bin storage capacity;
    (d) Details of intended method of collection;
    (e) Details of where the bins would be located when waiting collection;
    (f) Details of advice to be provided to owners and occupiers regarding the WMP; and
    (g) Details of how the WMP will continue to be applied in perpetuity across the life of the development, including the WMP being incorporated into the strata by-laws for the proposed development.

26. The bin storage areas are:

    (a) To be increased in size **equivalent to that which would be occupied by two additional bins** to cater for bulky rubbish storage while awaiting collection, to the satisfaction of the Town;
    (b) To be surrounded by a 1.8 metre high minimum wall with a self-closing gate;
    (c) To be provided with 75mm min thickness concrete floors grading to a 100mm industrial floor waste, connected to sewer, with a hose cock to enable both the bins and bin storage area to be washed out; and
    (d) To be provided with internal walls that are cement rendered (solid and impervious) to enable easy cleaning.

27. Bins shall be stored only in an approved, designated location, and shall not be stored within any of the approved car parking bays or associated access aisles.

28. The surface finish of boundary walls on the common boundaries with adjoining properties to be the same finish as the external wall finish for the remainder of the dwelling, unless otherwise approved by the Town.

29. Prior to the issue of a building permit the applicant shall lodge a Construction Management Plan to the satisfaction of the Town of Bassendean that provides details of the following:

    (a) Estimated timeline and phasing of construction;
    (b) Dust control measures;
    (c) Noise control measures;
    (d) Access points for heavy vehicles during demolition and construction; and
    (e) 24 hours contact details of staff available to deal with either an emergency situation or to respond to complaints.

30. The incorporation of public art into the proposed development or a cash-in-lieu payment of one percent of the construction cost of the proposed development in accordance with the Town's adopted Local Planning Policy No. 15 "Percent for Art Policy". Detailed arrangements and agreement with respect to art to be provided on site or alternatively payment of the required fee shall be made prior to or in conjunction with the application for a Building Permit.

31. Prior to the issue of a building permit, a development bond for the sum of $11,000 being lodged with Council to ensure the satisfactory completion of all works associated with landscaping, car parking, access ways, screen walls, and other associated works.

32. Prior to the issue of a building permit, an acoustic report shall be submitted to the Town for approval which shall:

    (a) be prepared by an acoustic consultant with relevant qualifications and experience equivalent to those required for admission as a Member of the Australian Acoustical Society (to the satisfaction of the Town's Health Services);

(b) include the presence of tonal components, amplitude or frequency modulations or impulses to ensure noise emissions received at the proposed noise sensitive premises are in compliance with the requirements of the Environmental Protection Act 1986.

(c) to satisfaction of the Town, address all matters that are required to demonstrate that acceptable noise criteria will be achieved including:

- the identification of all noise sources to be addressed from adjacent road and rail infrastructure as well as private properties at Lot 51 (No. 76) Railway Parade and Lot 4 (No. 6) Ivanhoe Street, including, but not limited to: noise emissions from refrigeration motors, air-conditioning units, vehicular movements (including customers and delivery vehicles) and rubbish disposal and collection;
- determination of noise source levels and character;
- acoustic data to be in octave bands where noise sources are internal;
- the establishment of Assigned Levels for noise sensitive premises in the vicinity in accordance with the *Environmental Protection (Noise) Regulations 1997*; and
- incorporate the following data:
  (i) date, time and results of measurements and or modelling used to represent the noise associated with live bands;
  (ii) assigned Levels determined for adjacent areas/noise sensitive premises in the vicinity; and
  (iii) recommendations for construction and noise control.

33. Measures recommended within the acoustic report shall be implemented to the satisfaction of the Town, and any costs associated with such implementation shall be the responsibility of the owner/applicant.

34. The building hereby approved shall not be occupied until all of the conditions of planning approval have been complied with to the satisfaction of the Town, unless the applicant has entered into an agreement with Council to comply with those conditions within a specified period.

35. This decision constitutes planning approval only and is valid for a period of 2 years from the date of approval. If the subject development is not substantially commenced within the 2 year period, the approval shall lapse and be of no further effect.

Advice Notes:

1. Council's Local Planning Policy No. 2 (LPP2), read in conjunction with Clause 5.3 of the Town's Local Planning Scheme No. 10, requires that each dwelling achieve a minimum 70 point score against the checklist contained within LPP2 to facilitate the density of development which has been proposed. Options available to the applicant to facilitate an increased points score for units 12-19 and 22 include:

   (a) Cutting back the roof cover to balconies by approximately 1.0m in order to facilitate direct winter sun penetration to living areas of these units (increasing the points score for each dwelling from 57.5 to the minimum required 70 point score); or alternatively

(b) Providing a solar hot water system for each of these dwellings (increasing the points score for each dwelling from 57.5 to 67.5) along with provision of a detailed landscaping plan which demonstrates low water use for the development as a whole (which would increase points score for each dwelling by a further 5 points to 72.5 points per dwelling).

The applicant is requested to incorporate solar hot water systems into the proposed development.

2. The applicant is advised that in relation to the requirement for a 1% Public Art contribution to be made that the Town can consider on site art works subject to Council approval and demonstration of equivalent value and public access.

3. Please liaise with the Town's Operational Services Directorate in relation to obtaining detailed specifications for works associated with widening of the right-of-way to the rear of the site, prior to undertaking any works on site.

4. The applicant is advised that the central median island within the Railway Parade road reserve allows for only left in / left out vehicle movements from the visitor parking bays on the Railway Parade frontage of the development site.

5. The issue of a Building Permit is required prior to the commencement of any works on site.

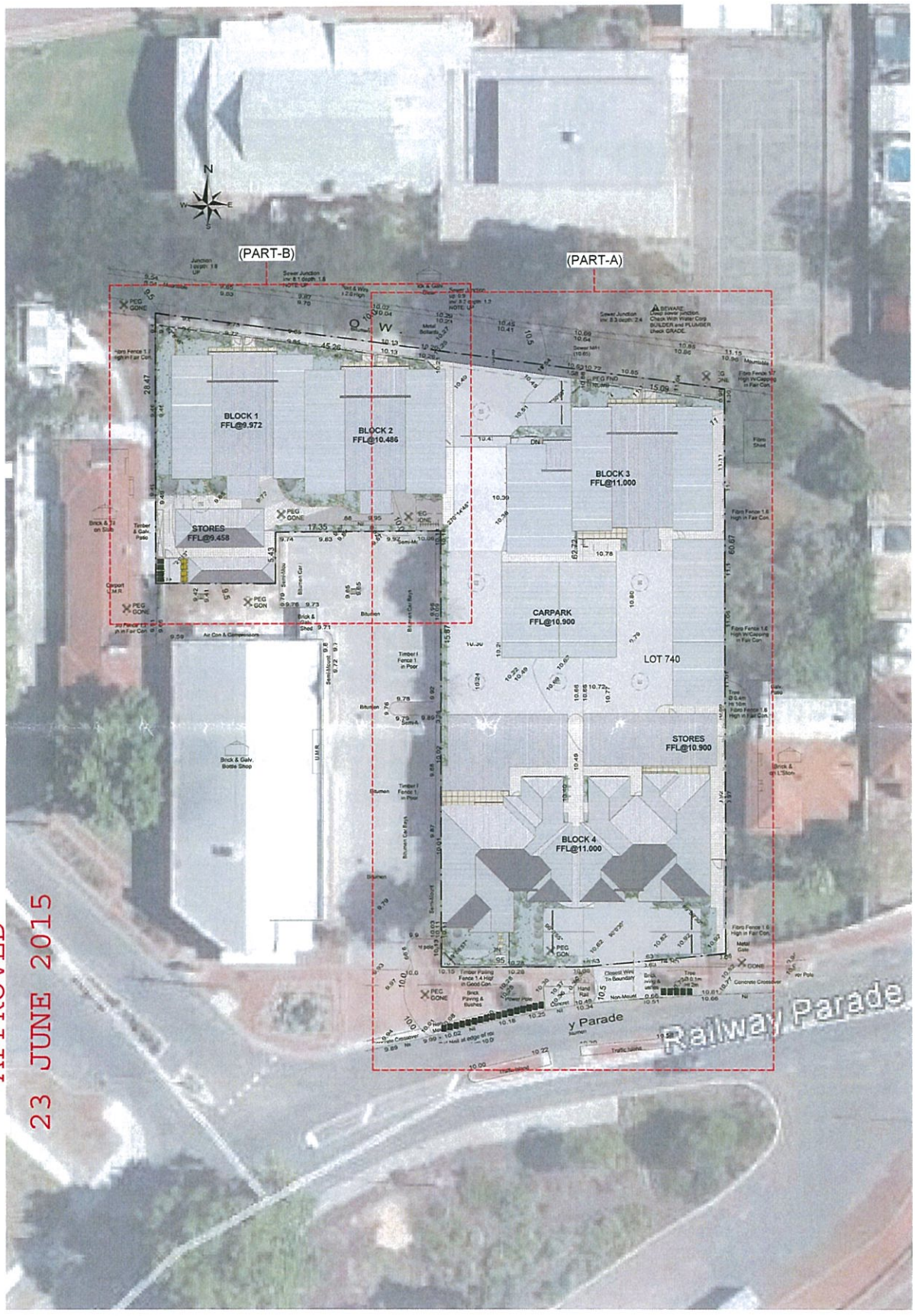
6. Dial Before You Dig:
Underground assets may exist in the area that is subject to your application. In the interests of health and safety and in order to protect damage to third party assets please telephone 1100 before excavating or erecting structures. If alterations are required to the configuration, size, form or design of the development upon contacting the Dial Before You Dig service, an amendment to the development consent (or a new development application) may be necessary. Individuals owe asset owners a duty of care that must be observed when working in the vicinity of plant or assets. It is the individual's responsibility to anticipate and request the nominal location of plant or assets on the relevant property via Dial Before You Dig "1100" number in advance of any construction activities.

7. Telecommunications Act 1997 (Commonwealth):
Telstra (and its authorised contractors) are the only companies that are permitted to conduct works on Telstra's network and assets. Any person interfering with a facility or installation owned by Telstra is committing an offence under the Criminal Code Act 1995 (Cth) and is liable for prosecution. Furthermore, damage to Telstra's infrastructure may result in interruption to the provision of essential services and significant costs. If you are aware of any works or proposed works which may affect or impact on Telstra's assets in any way, please contact Telstra's Network Integrity Team on 1800810443.

8. If the planning approval lapses, no development shall be carried out without further approval having first been sought and obtained.

9. If an applicant is aggrieved by this determination there is a right of review under Part 14 of the *Planning and Development Act 2005*. An application for review must be lodged within 28 days of the determination.

Where an approval has so lapsed, no development shall be carried out without further approval having first been sought and obtained, unless the applicant has applied and obtained Development Assessment Panel approval to extend the approval term under regulation 17(1)(a) of the *Development Assessment Panel Regulations 2011*.



DEVELOPMENT ASSESSMENT PANELS
APPROVED
23 JUNE 2015

Drawing List	
Sheet Number	Sheet Name
A1.01	PROPOSED SITE DEVELOPMENT PLAN (WITH AERIAL UNDERLAY)
A1.02	PROPOSED SITE DEVELOPMENT PLAN
A2.01	PROPOSED SITE / GROUND FLOOR PLAN (PART A)
A2.02	PROPOSED SITE / GROUND FLOOR PLAN (PART B)
A2.05	FIRST FLOOR PLAN
A3.01	ELEVATIONS
A3.02	ELEVATIONS
A4.01	PERSPECTIVES
Grand total: 8	

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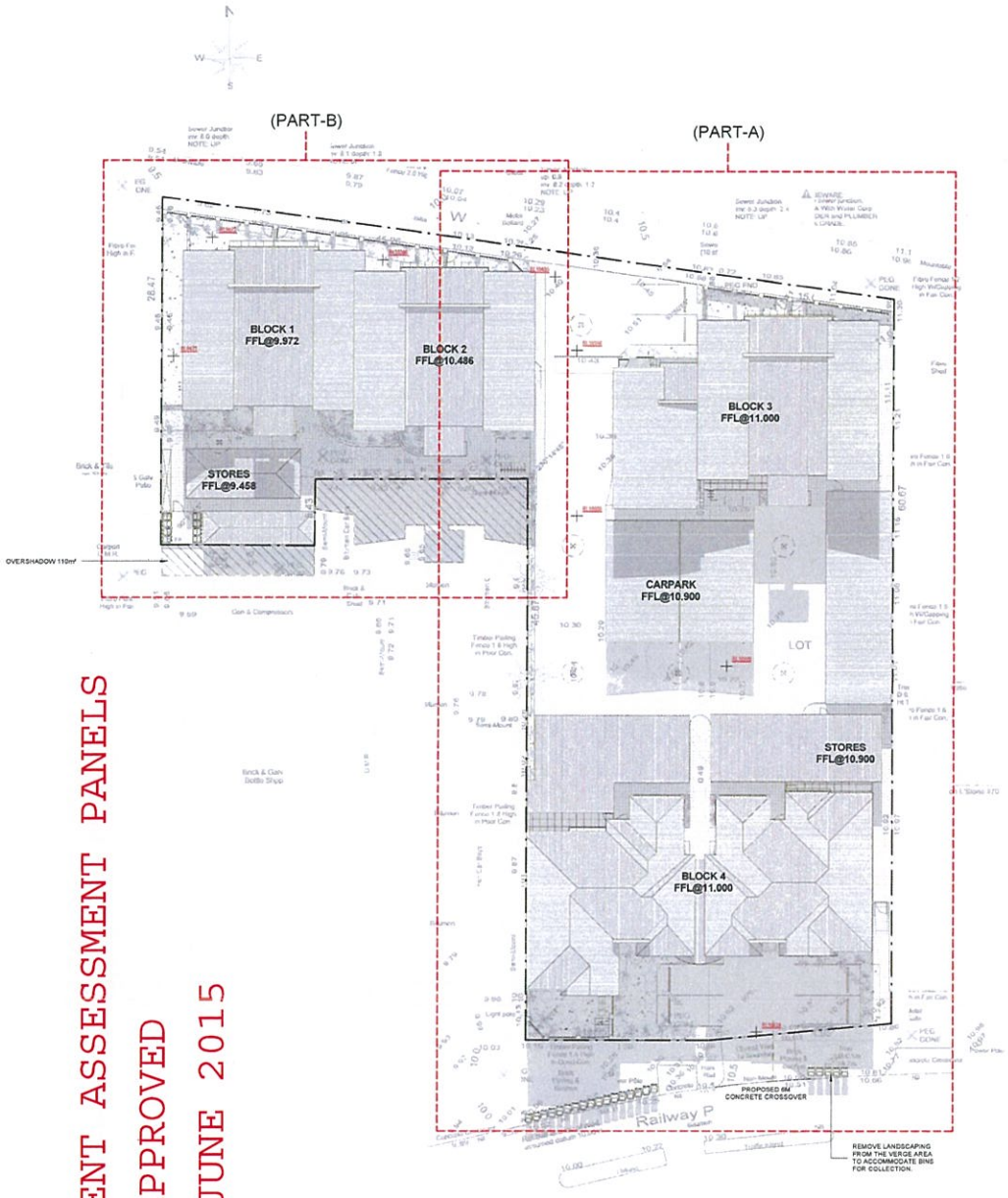
PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 54 (No.72) RAILWAY PARADE, BASSENDEAN,
(Town of Bassendean)

No.	Description	Date
1	DA PLANS	02.02.2015
2	REVISED DA	11.05.2015

PROPOSED SITE DEVELOPMENT PLAN (WITH AERIAL UNDERLAY)

Project number	1414	Drawing number	Revision
Issue Date	11.05.2015	A1.01	2
Drawn by	ME		
Checked by	CF	Scales @ A1	1:200

PROPOSED SITE COVER 1386m² (54%)
PROPOSED OPEN SPACE 1175m² (46%)



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PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 54 (No.72) RAILWAY PARADE, BASSENDEAN,
(Town of Bassendean)

No.	Description	Date
1	DA PLANS	02.02.2015
2	REVISED DA	11.05.2015

PROPOSED SITE DEVELOPMENT PLAN

Project number: 1414
Issue Date: 11.05.2015
Drawn by: NB
Checked by: CH
Drawing number: A1.02
Revision: 2
Scale: 1 : 200

DEVELOPMENT ASSESSMENT PANELS
APPROVED
23 JUNE 2015

PLOT RATIO AREA	
Name	Area
UNIT 1	74.44 m²
UNIT 2	74.44 m²
UNIT 3	74.44 m²
UNIT 4	74.44 m²
UNIT 5	98.73 m²
UNIT 6	74.44 m²
UNIT 7	74.44 m²
UNIT 8	74.24 m²
UNIT 9	70.81 m²
UNIT 10	91.87 m²
UNIT 11	70.86 m²
UNIT 12	74.44 m²
UNIT 13	74.44 m²
UNIT 14	70.74 m²
UNIT 15	74.44 m²
UNIT 16	86.27 m²
UNIT 17	74.44 m²
UNIT 18	74.44 m²
UNIT 19	74.57 m²
UNIT 20	91.71 m²
UNIT 21	91.70 m²
UNIT 22	74.29 m²
Grand total: 22	1633.58 m²

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PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 54 (No.72) RAILWAY PARADE, BASSENDEAN.
(Town of Bassendean)

No.	Description	Date
1	DA PLANS	02.02.2015
2	REVISED DA	11.05.2015

PROPOSED SITE / GROUND FLOOR PLAN (PART A)

Project number	1416	Drawing number	Revision
Issue Date	11.05.2015	A2.01	2
Drawn by	MC		
Checked by	CF	Scales @ A1	1 : 100

DEVELOPMENT ASSESSMENT PANELS
APPROVED
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UNIT	ORIENTATION (LONGEST AXIS FACING NORTH)	NORTH FACING COURTYARD AND LIVING AREA WINDOWS 50% OF NORTH WALL	BED WINDOWS MINIMISED IN AREA AND NORTH FACING (1BED SOUTH FACING)	EAST AND WEST FACING WALLS BLANK	60% ROOMS CROSS VENTILATED	SOLAR HOT WATER UNIT OR SOLLER PERGOLA	LANDSCAPE DESIGN COPLIANCE	TOTAL
1	0	25	15	20	10	0	0	70
2	0	25	15	20	10	0	0	70
3	0	25	15	20	10	0	0	70
4	0	25	15	20	10	0	0	70
5	0	25	15	20	10	0	0	70
6	0	25	15	20	10	0	0	70
7	0	25	15	20	10	0	0	70
8	0	25	15	20	10	0	0	70
9	0	25	15	20	10	0	0	70
10	0	25	15	20	10	0	0	70
11	0	25	15	20	10	0	0	70
12	0	25	15	20	10	0	0	70
13	0	25	15	20	10	0	0	70
14	0	25	15	20	10	0	0	70
15	0	25	15	20	10	0	0	70
16	0	25	15	20	10	0	0	70
17	0	25	15	20	10	0	0	70
18	0	25	15	20	10	0	0	70
19	0	25	15	20	10	0	0	70
20	0	25	15	20	10	0	0	70
21	0	25	15	20	10	0	0	70
22	0	25	15	20	10	0	0	70

Deciduous Tree:
Acer rubrum

Shrubs:
Clerodendrum inerme;
Senna pleurocarpa;
Grevillea eriostachya

Turf

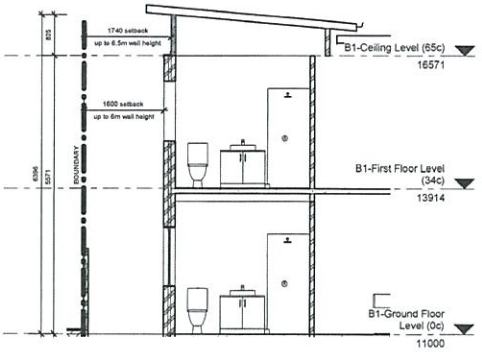
PLOT RATIO AREA	
Name	Area
UNIT 1	74.44 m²
UNIT 2	74.44 m²
UNIT 3	74.44 m²
UNIT 4	74.44 m²
UNIT 5	105.73 m²
UNIT 6	74.44 m²
UNIT 7	74.44 m²
UNIT 8	74.29 m²
UNIT 9	70.87 m²
UNIT 10	71.87 m²
UNIT 11	72.66 m²
UNIT 12	74.44 m²
UNIT 13	74.44 m²
UNIT 14	72.74 m²
UNIT 15	74.44 m²
UNIT 16	105.27 m²
UNIT 17	74.44 m²
UNIT 18	74.44 m²
UNIT 19	74.52 m²
UNIT 20	71.71 m²
UNIT 21	71.70 m²
UNIT 22	74.29 m²
Grand total: 22	1643.96 m²

PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 54 (No.72) RAILWAY PARADE, BASSENDEAN,
(Town of Bassendean)

No.	Description	Date
1	DA PLANS	02.02.2015
2	REVISED DA	11.05.2015

PROPOSED SITE / GROUND FLOOR PLAN (PART B)

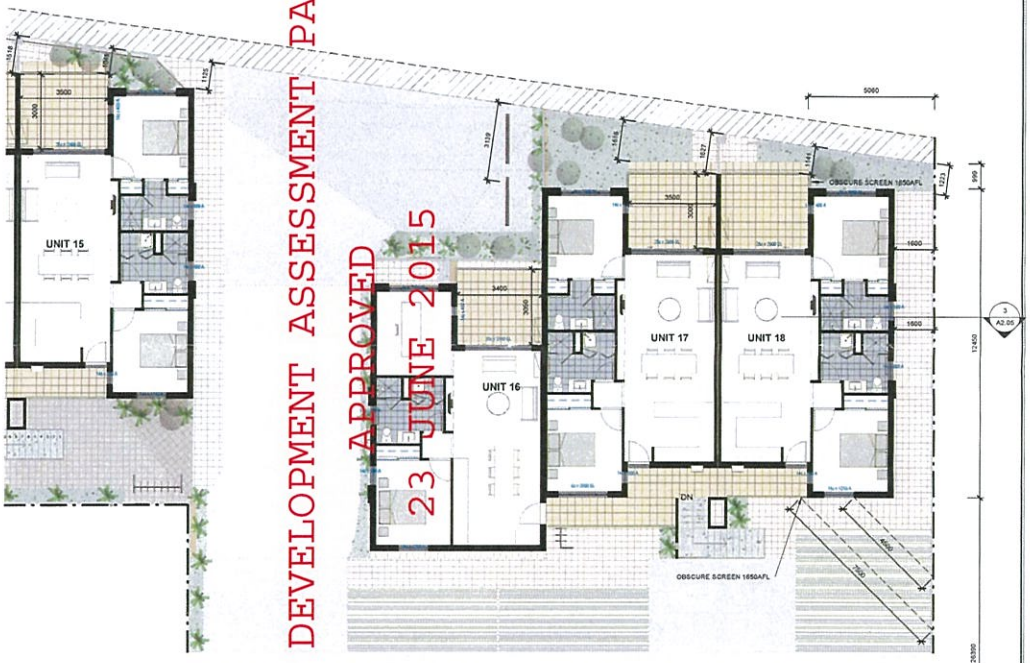
Project number: 1414
Issue Date: 11.05.2015
Drawn by: HK
Checked by: CF
Drawing number: A2.02
Revision: 2
Scale: 1:100



3 Section 1
SCALE 1 : 50

2 FIRST FLOOR PLAN (PART-B)
SCALE 1 : 100

DEVELOPMENT ASSESSMENT PANELS
APPROVED
23 JUNE 2015



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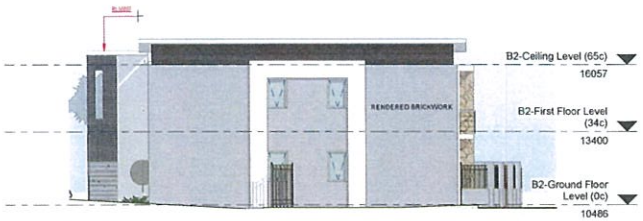
1 FIRST FLOOR PLAN (PART-A)
SCALE 1 : 100

PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 54 (No.72) RAILWAY PARADE, BASSENDEAN,
(Town of Bassendean)

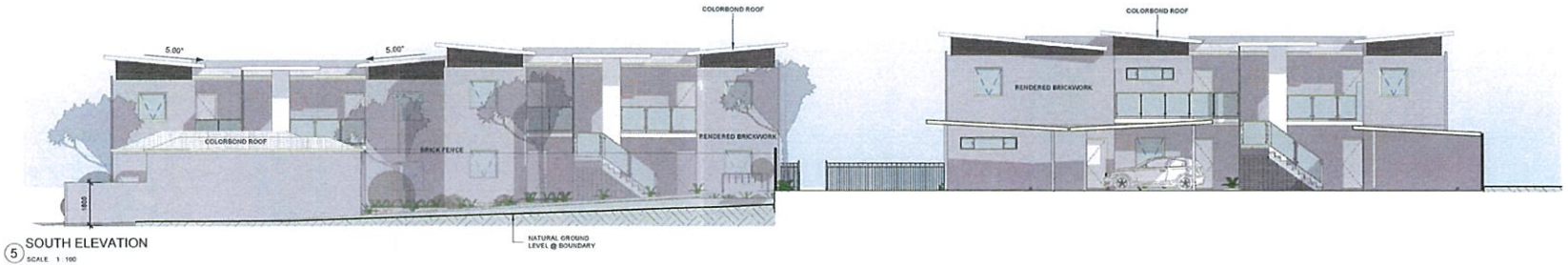
No.	Description	Date
1	DA PLANS	02.02.2015
2	REVISED DA	11.05.2015

FIRST FLOOR PLAN

Project number 1414
Issue Date 11.05.2015
Drawn by NE
Checked by CF
Drawing number A2.05
Revision 2
Scale (at A1) As Indicated



1 UNIT 4 EAST ELEVATION
SCALE 1:100



5 SOUTH ELEVATION
SCALE 1:100

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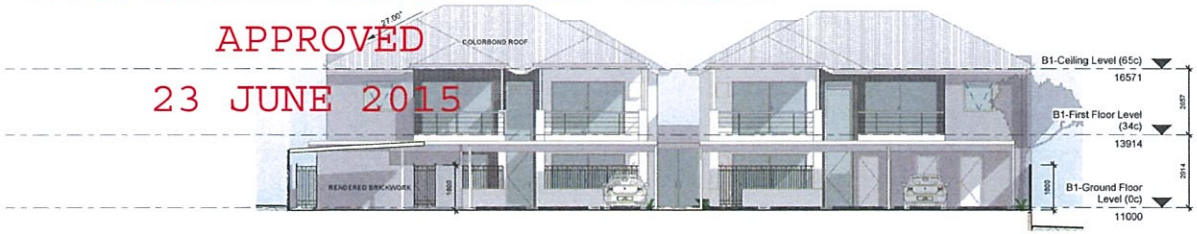
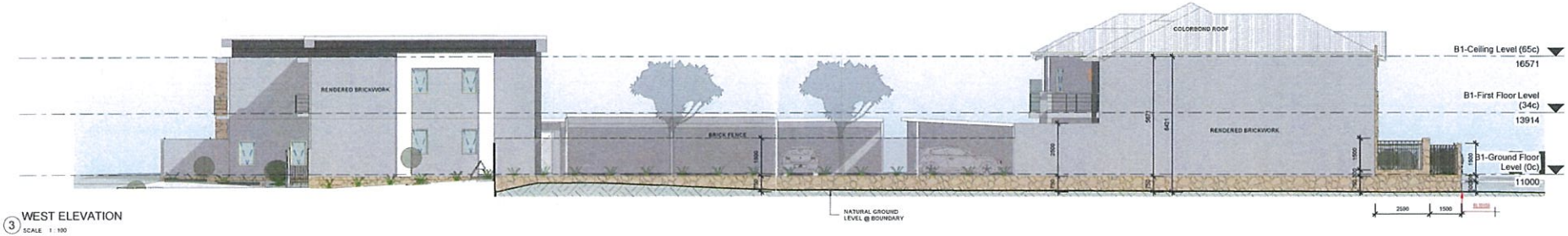
23 JUNE 2015



2 NORTH ELEVATION FRONT BLOCK
SCALE 1:100



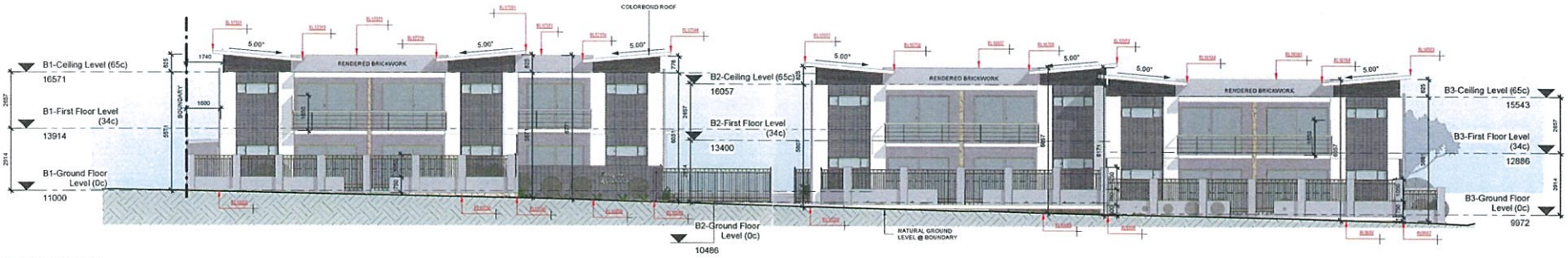
3 WEST ELEVATION
SCALE 1:100

PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 34 (NO 723) RAILWAY PARADE, BASSENDEAN.
(Town of Bassendean)

No.	Description	Date
1	DA PLANS	02.02.2015
2	REVISED DA	11.06.2015

ELEVATIONS
A3 01
2

1 RAILWAY PARADE ELEVATION
SCALE 1 : 100



2 ROW ELEVATION
SCALE 1 : 100

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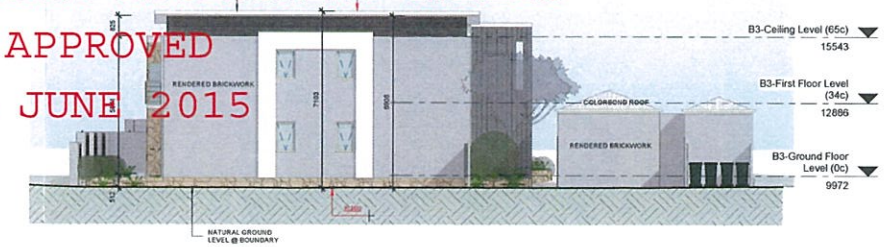
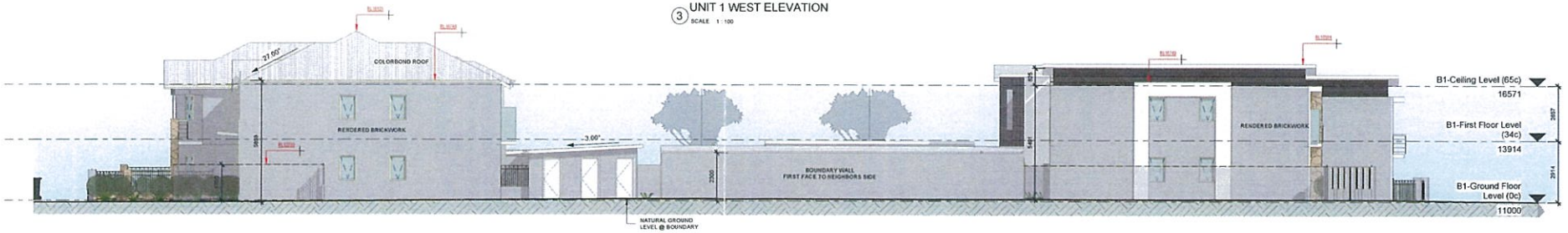


3 UNIT 1 WEST ELEVATION
SCALE 1 : 100



4 EAST ELEVATION
SCALE 1 : 100

PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 54 (No 72) RAILWAY PARADE, BASSENDEAN.
(Town of Bassendean)

No.	Description	Date
2	RAILWAY PARADE ELEVATIONS REVISED DA	11.05.2015 11.06.2015

ELEVATIONS

A3.02

2

DEVELOPMENT ASSESSMENT PANELS
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23 JUNE 2015

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TOWN PLANNERS & BUILDING DESIGNERS
Unit 8, 16 Kent Way MALAGA WA 6009 Tel: (08) 9248 8777 Fax: (08) 9248 4040

18/05/2015 10:48:28 AM

N

PROPOSED MULTIPLE DWELLING DEVELOPMENT
LOTS 54 (No.72) RAILWAY PARADE, BASSENDEAN,
(Town of Bassendean)

No.	DESCRIPTION	DATE
3	VERGE PICK UP PLAN	18.05.2015

22 BINS VERGE PICKUP PLAN

Project number	1416
Issue Date	18.05.2015
Drawn by	NK
Checked by	CF

Drawing number: **A0.00**

Revision/Issue: **3**

Scale @ A3: 1 : 100

urban & rural perspectives

URP

TOWN PLANNERS & BUILDING DESIGNERS

31 March 2017

Chief Executive Officer
Town of Bassendean
PO Box 87
BASSENDEAN WA 6934

Document #: IPA-11884817
Date: 31.03.2017
Officer: MARY BIDSTRUP
File: A4380

Attention: Mr Brian Reed – Manager, Development Services

Dear Brian

APPLICATION TO AMEND DEVELOPMENT APPROVAL
PROPOSED MULTIPLE DWELLING DEVELOPMENT (22 APARTMENTS)
LOT 54 (NOS.72 & 74) RAILWAY PARADE, BASSENDEAN
TOWN OF BASSENDEAN (YOUR REF: DA2015-030 & DAP/15/00740)

Urban & Rural Perspectives, on behalf of the current landowners, hereby submit an application seeking the Metro Central Joint Development Assessment Panel's approval to:

a) amend the current development approval for the abovementioned property so as to extend the period within which the proposed multiple dwelling development must be substantially commenced; and

b) delete a number of conditions to which the approval is currently subject.

Please find enclosed the following information to assist the Town and Joint Development Assessment Panel's consideration and processing of the application:

- A completed and signed 'Application for Development Approval' form;
- A completed and signed 'Application for Amendment of a Development Assessment Panel Determination' form (DAP Form 2);
- A copy of the Certificate of Title for Lot 54;
- Remittance of $450.00 being the application fees payable to the Town and Development Assessment Panel (i.e. $295.00 and $155.00 respectively);
- Three (3) hard copies of scaled plans prepared in support of the application; and
- Two (2) compact discs containing a copy of the application documentation and plans in electronic format.

We request that a receipt in respect of the abovementioned application fees be forwarded to this office at **PO Box 2507 MALAGA WA 6944** at the Town's earliest convenience.

When assessing the application we ask that the Town and Metro Central Joint Development Assessment Panel (JDAP) have due regard for the following key points:

1. On 1 July 2015 the Metro Central JDAP granted conditional planning approval for the development of twenty two (22) new multiple dwellings on Lot 54.

2. A number of conditions imposed on the planning approval required the preparation and submission of amended plans for consideration and approval by the Town prior to preparation and lodgment of a building permit application. Amended plans were subsequently prepared by this office and submitted to the Town on 23 July 2015.

TOWN OF BASSENDEAN
04 APR 2017
RECEIVED

Unit 8 / 16 Kent Way MALAGA, W.A. 6090
■ Tel: 08 9248 8777 ■ Fax: 08 9248 4040 ■ Email: enquiries@urp.com.au ■ Website: www.urp.com.au
All correspondence to: PO Box 2507 MALAGA, W.A. 6944. ABN 27 653 527 435

3. Processing of the amended plans by the Town took a considerable amount of time. The Towns' acceptance of the amended plans was provided via email on 26 November 2015 however formal correspondence confirming its approval was not provided to this office until 8 January 2016.

4. Given the time taken to secure the Town's formal written approval to the amended plans, the two (2) year planning approval period has been substantially diminished. The associated loss of time has had a significant impact on the future development of the land in terms of the preparation of working drawings, appointment of specialist consultants, arranging building contracts, pre-sales and construction financing.

5. In light of the above, the landowners would like to secure the JDAP's formal approval to amend the current planning approval for Lot 54 by extending the period within which the proposed multiple dwelling development must be substantially commenced. An additional two (2) year approval term is hereby requested.

6. In addition to our request to extend the period of the current planning approval for Lot 54, approval is sought to delete the following conditions from the original approval when issuing a new approval on the grounds these conditions have now been addressed to the Town's satisfaction through the preparation and submission of amended plans (see Attachment 1):

   - Conditions 1 to 4 inclusive;
   - Condition 15;
   - Condition 16;
   - Condition 17;
   - Condition 21;
   - Condition 24; and
   - Condition 26.

In light of the above information we respectfully request the Town and Metro Central JDAP's favorable consideration and the JDAP's approval of this application at its earliest possible convenience.

Should you have any queries or require any additional information please do not hesitate to contact the undersigned of this office on 9248 8777 or joe@urp.com.au.

Yours faithfully,

Joe Douglas
Managing Director / Principal Town Planner
Urban & Rural Perspectives

Encl. Completed & signed 'Application for Development Approval' form & 'DAP Form 2'
Application fees of $450.00 (Cheque)
Three (3) hard copies of the amended site development plans
Two (2) compact discs containing electronic copies of the application documentation & plans

cc: Mark & Sandra Hammond - Landowners

Unit 8 / 16 Kent Way MALAGA, W.A. 6090
■ Tel: 08 9248 8777 ■ Fax: 08 9248 4040 ■ Email: enquiries@urp.com.au ■ Website: www.urp.com.au
All correspondence to: PO Box 2507 MALAGA, W.A. 6944. ABN 27 653 527 435

ATTACHMENT NO. 5

1.9 Verge Treatment and Maintenance Policy

Street verges within the Town perform important functions including the provision of space for public utility services, increased public space and the visual linking of streetscapes. In the interests of Bassendean's wellbeing into the future, the Town wishes to encourage landscaping that is waterwise, aesthetically pleasing and reflects our natural heritage.

It is acknowledged that verges form part of the public realm. Whilst Council allocates funding for the maintenance of selected verges, generally those adjacent to major or distributor roads, the Town relies on the goodwill and cooperation of adjacent land owners/occupiers for the maintenance of their verges.

Objectives

The objectives of this policy are to encourage adjacent owners/occupiers to install and maintain Permissible Verge Treatments in accordance to Activities on Thoroughfares and Trading in Thoroughfares and Public Places Local Law, for the installation and management of verges that are waterwise, aesthetically pleasing, and that reflect our natural heritage.

Council does not mow or slash verges adjacent to all private, commercial or industrial property on the basis that owners and residents with civic pride undertake this activity as a contribution to the amenity of the Town. This allows Council to direct its resources to priority services.

Strategy

The Town of Bassendean will achieve these objectives through the application of "Permissible Verge Treatment" guidelines (see Appendix 1) with which to assess requests to develop new or alter existing verge treatments and the development of a priority verge slashing program to reduce the grass loadings through out the year, within the allocated budget constraints.

Street verge slashing program is a grass reduction service not a lawn mowing service and will be provided within budget constraints, in accordance with the following priorities:

Priority One - Primary and District Distributor Roads – Guildford Rd, Lord St, Walter Rd East, Morley Drive (as arranged with the Shire of Swan), Collier Rd and Railway Parade, and areas required to be carried out for reasons of fire, traffic, cyclist or pedestrian safety.

Priority Two - Local Distributor Roads – West Rd, Ivanhoe St, Old Perth Rd, Hardy Rd, Reid St, Broadway, Northmoor Rd, Iolanthe St, Palmerston St, Shackleton St, Bridson St, Haig St and Colstoun Rd.

Priority Three - Local Roads - Scaddan St, North Rd, Bassendean Parade, Pearson St and Surrey St.

Priority Four - Verges adjacent to vacant and corner blocks, cul-de-sac heads, and closed road sections in other roads.

Note:

1. Verges adjacent to Council controlled reserves are to be mown as part of those reserves; and
2. Verges maintained by the resident are not included in the verge slashing program.

Detail

This policy applies to the portion of land between the road kerb/edge and the property boundary. The requirements of the policy exclude footpaths and crossovers.

Treatments should be attractive and provide a positive enhancement to the streetscape. Street tree planting shall be in accordance to the adopted Street Tree Master Plan. Street trees remain the responsibility of the Town and are therefore, excluded from this policy.

Application

Responsibility for the implementation of this policy rests with the Mayor, Councillors, Council delegates and Chief Executive Officer. The Chief Executive Officer (CEO) has the authority to administer the requirements of this policy. The CEO has on-delegated this authority to the Manager Asset Services.

The Policy is to be reviewed every three years.

Policy Type: Strategic Policy **Link to Strategic Community Plan:** Town Planning & Built Environment	**Policy Owner:** Director Operational Services **First Adopted:** OCM-12/12/11 **Last Review Date:** March 2014 **Version 1** **Next Review due by:** December 2016

Appendix 1

PERMISSIBLE VERGE TREATMENTS

Introduction

The portion of land between a property boundary and the carriageway or road is referred to as the verge. Property owners or residents of land abutting the verge may install a permissible verge treatment.

A permissible verge treatment is one that is approved by Council and subject to stringent conditions.

Waterwise management practices are encouraged for verge treatments. The Water Corporation webpage (www.watercorporation.com.au) has a range of initiatives to assist residents minimise water usage.

Permissible Verge Treatments

The Activities on Thoroughfares and Trading in Thoroughfares and Public Places Local Law 2010 states:

Division 1 - General prohibitions : A person must not plant any plant except grass within 6m of an intersection

Division 3 - Permissible Verge treatments:

(1) An owner or occupier of land, which abuts on a verge, may on that part of the verge directly in front of her or his land install a permissible verge treatment.

(2) The permissible verge treatments are:

- *(a) the planting and maintenance of a lawn;*
- *(b) the planting and maintenance of a garden provided that:*
  - *(i) clear sight visibility is maintained at all times for a person using the abutting thoroughfare in the vicinity of an intersection or bend in the thoroughfare or using a driveway on land adjacent to the thoroughfare for access to or from the thoroughfare;*
  - *(ii) where there is no footpath, a pedestrian has safe and clear access of a minimum width of 2m along that part of the verge immediately adjacent to the kerb;*
  - *(iii) it does not include a wall or built structure; and*
  - *(iv) it is not of a thorny, poisonous or hazardous nature; or*
- *(c) the installation of an acceptable material; or*
- *(d) the installation of an acceptable material or other verge treatment in accordance with paragraph (c), and the planting and maintenance of either a lawn or a garden on the balance of the verge in accordance with paragraph (a) or (b).*

Acceptable materials	Conditional requirements
1. Composted mulch or chipper mulch material 2. Small format Permeable/ Porous Pavers	➢ Street Tree Protection policy requirements are applied to ensure the long-term health of the tree ➢ To protect the tree roots, all earth works under the tree drip line shall be performed using hand tools ➢ Verge pavers shall be at least 20 per cent porous

Acceptable materials	Conditional requirements
3. Irrigation system 4. Grass 5. Low growing ground cover plants	➢ Storm water on verge shall be managed on site ➢ Verge pavers shall not be laid within 2 metres from base of existing tree trunk ➢ A minimum of 2 metre wide street tree planting bay (s) shall be provided for future street tree (s) ➢ No more than one third of the verge shall be paved excluding the crossover ➢ Mulch or paving once installed shall not be higher than the adjacent kerb line, footpath or crossover ➢ Paving shall tolerate limited vehicle traffic ➢ Below ground irrigation / pop up sprinklers

Examples of Non - Acceptable materials	Reason
1. Frangible objects such as mounds, rocks, sleepers, walls, and garden kerbs 2. Loose objects such as gravel or aggregate 3. In-situ concrete, concrete slabs, and bitumen 4. Artificial turf	➢ Frangible objects may be considered unsafe, cause damage or be used to cause damage ➢ Loose objects impact upon pedestrian safety ➢ Concrete & bitumen have poor water permeability and contribute to storm water flow ➢ Synthetic turf may reduce soil health and contribute to the urban heat island effect by absorbing sunlight and emitting heat

Irrigation & Planting requirements

Irrigation of the verge is an acceptable material on the following condition:

- Gate value(s) / solenoid value(s) are located on private property
- Installation of retractable sprinkler heads, level with grass surface
- Irrigation system designed to ensure that the water is not distributed onto paved surfaces.
- Irrigation is applied in accordance to Waterwise for WA water roster requirements.

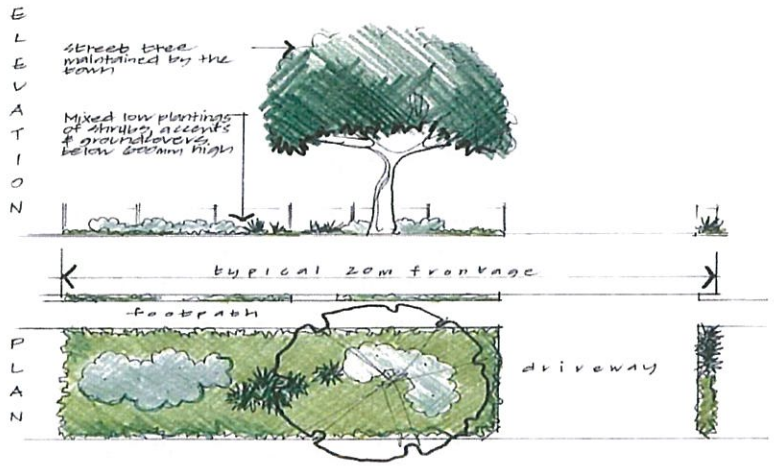
In regards to the landscaping of the verge, it is essential to provide at all times clear sight visibility for both pedestrians and vehicles. Where there is no footpath, safe and clear access shall be provided for pedestrians. No plant except grass or a similar ground cover plant is to be grown within 2 metres of a road edge and no plant except grass or a similar ground cover plant is to be within 6 metres of an intersection. Other low growing plants shall not exceed 0.75 metres in height.

The sketch landscape plan below is provided to assist the owner / occupier of the lot abutting a verge, appreciate visually the verge planting requirements. In this plan, the plants have been arranged so that grass or a similar ground cover plant covers are placed at edges and low growing plant towards the middle of the verge area.

Where street trees are growing under the overhead power lines it is essential that that the Town of Bassendean approved contractors have appropriate machinery access to carry out street tree pruning operations. Should a verge treatment proposal prevent a street tree from being maintained/ pruned or will damage an existing street tree, the application shall be refused.

When considering landscaping a verge, the planting of endemic (local native) low growing groundcovers and shrubs are strongly encouraged. *Grow Local* native plants brochures can be obtained from the Town's Customer Service information desk. The brochure contains a range of hints and information on how to use and look after native plants

Below is an example of a verge landscaped plan



Important Information:

- Please refer to the Council adopted Verge Treatment Policy, Street Tree Protected Policy and the Crossover Policy are available for viewing on the Town of Bassendean webpage at: www.bassendean.wa.gov.au/information & feedback/policies.
- Before the owner/occupier of the lot abutting a verge or contractors start to dig, plough, excavate or undertake any sub-surface activity, contact the "Dial Before You Dig" service on telephone 1100 to access indicative plans / information within 4-5 days on underground pipes and cables. Failure to take steps to avoid damage may leave you liable for costs incurred in the event of infrastructure damage.
- Local native plants will generally need to be watered for the first two summers until established. Some non-native plant species whilst 'waterwise' should be avoided as there is the potential for seed dispersal into natural areas. For this reason local natives are preferred

APPENDIX 2

VERGE TREATMENT APPLICATION FORM

Name of Applicant: .....
Property Address: .....
Email: .....
Telephone (Hom): .....(Mob): .....

Verge Treatment Details

Please (√) tick to confirm the required information has been attach to the verge treatment application form.

- ☐ Sketch plan of proposed verge treatment attached
- ☐ Specification of material planned to be utilised provided
- ☐ If garden to be provided, ensure plant species proposed are clearly shown.
- ☐ Reticulation plan of proposed spray or drip reticulation attached
- ☐ Dial before you dig information attached
- ☐ Request the Town plant and maintain a street tree.

Please Note: If above supporting information is not submitted with application, the Town will have no option but to reject application until relevant information is provided

For General Information Sheets, please refer to the Town of Bassendean web page at : www.bassendean.wa.gov.au/ for the following:

* "Street Tree" – *Telephone 93779000 or request in writing a street tree (s) be planted*
* "Street Tree Protection"- *building permit requirements.*
* "Crossovers" – *constructed in accordance to Town's specifications*
* "Availability of Mulch" *Free mulch during specified time frames or pay for delivery.*

I/we, agree:

1. *to maintain the verge area in accordance to the approved permissible verge treatment in a good and tidy condition and ensure that pedestrian access will be maintained.*
2. *that service utilities on occasions will require access to the verge area to undertake underground, above ground routine work and street tree pruning operations.*
3. *that if the approved permissible verge treatment is damaged as a result of the routine work, the applicant shall reinstate the area at no cost to the Town of Bassendean.*

Applicant (s) Name .....
Applicant/s Signature .....
Date: .....

Please note that landscaping of verge area shall not be undertaken without written approval that the application is in accordance to the Permissible Verge Treatment requirements

OFFICE USE ONLY

Required Verge Treatment documentation and Plans submitted	☐ Yes ☐ No
Street Tree Protected policy considered & applied	☐ Yes ☐ No
Acceptable materials utilized	☐ Yes ☐ No
Pedestrian Access provided	☐ Yes ☐ No
Existing / Future Street Tree considered	☐ Yes ☐ No

Application ☐ Approved ☐ Refused

Comments:

.....

.....

Officer Title : ..... Date: ..... Applicant advised Yes ☐

TOWN OF BASSENDEAN
Home by the Swan

Information Sheet

Permissible Verge Treatment

Introduction

The portion of land between a property boundary and the carriageway or road is referred to as the verge. Property owners or residents of land abutting the verge may install a permissible verge treatment.

A permissible verge treatment is one that is approved by Council and subject to stringent conditions.

Waterwise management practices are encouraged for verge treatments. The Water Corporation webpage (www.watercorporation.com.au) has a range of initiatives to assist residents minimise water usage.

Permissible Verge Treatments

The Activities on Thoroughfares and Trading in Thoroughfares and Public Places Local Law 2010 states:
Division 1 - General prohibitions : A person must not plant any plant except grass within 6m of an intersection
Division 3 - Permissible Verge treatments:

(1) An owner or occupier of land, which abuts on a verge, may on that part of the verge directly in front of her or his land install a permissible verge treatment.

(2) The permissible verge treatments are:

- *(a) the planting and maintenance of a lawn;*
- *(b) the planting and maintenance of a garden provided that:*
  - *(i) clear sight visibility is maintained at all times for a person using the abutting thoroughfare in the vicinity of an intersection or bend in the thoroughfare or using a driveway on land adjacent to the thoroughfare for access to or from the thoroughfare;*
  - *(ii) where there is no footpath, a pedestrian has safe and clear access of a minimum width of 2m along that part of the verge immediately adjacent to the kerb;*
  - *(iii) it does not include a wall or built structure; and*
  - *(iv) it is not of a thorny, poisonous or hazardous nature; or*
- *(c) the installation of an acceptable material; or*
- *(d) the installation of an acceptable material or other verge treatment in accordance with paragraph (c), and the planting and maintenance of either a lawn or a garden on the balance of the verge in accordance with paragraph (a) or (b).*

Acceptable materials	Conditional requirements
1. Composted mulch or chipper mulch material 2. Small format Permeable/ Porous Pavers 3. Irrigation system 4. Grass 5. Low growing ground cover plants	➢ Street Tree Protection policy requirements are applied to ensure the long-term health of the tree ➢ To protect the tree roots, all earth works under the tree drip line shall be performed using hand tools ➢ Verge pavers shall be at least 20 per cent porous ➢ Storm water on verge shall be managed on site ➢ Verge pavers shall not be laid within 2 metres from base of existing tree trunk ➢ A minimum of 2 metre wide street tree planting bay (s) shall be provided for future street tree (s) ➢ No more than one third of the verge shall be paved excluding the crossover ➢ Mulch or paving once installed shall not be higher than the adjacent kerb line, footpath or crossover ➢ Paving shall tolerate limited vehicle traffic ➢ Below ground irrigation / pop up sprinklers

Examples of Non - Acceptable materials	Reason
1. Frangible objects such as mounds, rocks, sleepers, walls, and garden kerbs 2. Loose objects such as gravel or aggregate 3. In-situ concrete, concrete slabs, and bitumen 4. Artificial turf	➢ Frangible objects may be considered unsafe, cause damage or be used to cause damage ➢ Loose objects impact upon pedestrian safety ➢ Concrete & bitumen have poor water permeability and contribute to storm water flow ➢ Synthetic turf may reduce soil health and contribute to the urban heat island effect by absorbing sunlight and emitting heat

Irrigation & Planting requirements

Irrigation of the verge is an acceptable material on the following condition:

- Gate value(s) / solenoid value(s) are located on private property
- Installation of retractable sprinkler heads, level with grass surface
- Irrigation system designed to ensure that the water is not distributed onto paved surfaces.
- Irrigation is applied in accordance to Waterwise for WA water roster requirements.

In regards to the landscaping of the verge, it is essential to provide at all times clear sight visibility for both pedestrians and vehicles. Where there is no footpath, safe and clear access shall be provided for pedestrians. No plant except grass or a similar ground cover plant is to be grown within 2 metres of a road edge and no plant except grass or a similar ground cover plant is to be within 6 metres of an intersection. Other low growing plants shall not exceed 0.75 metres in height.

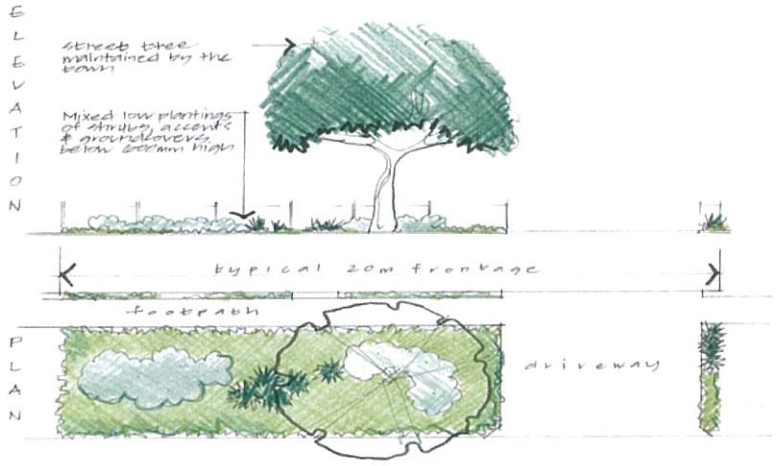
The sketch landscape plan below is provided to assist the owner / occupier of the lot abutting a verge, appreciate visually the verge planting requirements. In this plan, the plants have been arranged so that grass or a similar ground cover plant covers are placed at edges and low growing plant towards the middle of the verge area.

Where street trees are growing under the overhead power lines it is essential that that the Town of Bassendean approved contractors have appropriate machinery access to carry out street tree pruning operations. Should a verge treatment proposal prevent a street tree from being maintained/ pruned or will damage an existing street tree, the application shall be refused.

When considering landscaping a verge, the planting of endemic (local native) low growing groundcovers and shrubs are strongly encouraged. *Grow Local* native plants brochures can be obtained from the Town's Customer Service information desk. The brochure contains a range of hints and information on how to use and look after native plants

Over the page is shown an example of a verge landscaped plan

Information Sheet



Important Information:

- Please refer to the **Verge Treatment, Street Tree Protection, Significant Tree** and the **Crossover** information sheets which are available for viewing on the Town of Bassendean web page at: www.bassendean.wa.gov.au / information & feedback/ policies
- Before the owner / occupier of the lot abutting a verge or contractors start to dig, plough, excavate or undertake any sub-surface activity, contact the "Dial Before You Dig" service on telephone 1100 to access indicative plans / information within 4-5 days on underground pipes and cables. Failure to take steps to avoid damage may leave you liable for costs incurred in the event of infrastructure damage.
- Local native plants will generally need to be watered for the first two summers until established. Some non-native plant species whilst 'waterwise' should be avoided as there is the potential for seed dispersal into natural areas. For this reason local natives are preferred.

See overleaf for Verge Treatment Permit Application Form.

Information Sheet

VERGE TREATMENT PERMIT APPLICATION FORM

Name of Applicant: .....
Property Address: .....
Email: .....
Telephone (Hm): .....(Mb): .....

Verge Treatment Details

Please (√) tick to confirm the required information has been attached to the verge treatment application form.

- ☐ Sketch plan of proposed verge treatment attached
- ☐ Specification of material planned to be utilised provided
- ☐ If garden to be provided, ensure plant species proposed are clearly shown.
- ☐ Reticulation plan of proposed spray or drip reticulation attached
- ☐ Dial before you dig information attached
- ☐ Request the Town plant and maintain a street tree.

Please Note: If above supporting information is not submitted with application, the Town will have no option but to reject application until relevant information is provided

For General Information Sheets, please refer to the Town of Bassendean web page at : www.bassendean.wa.gov.au/ for the following:

* "Significant Trees" - *guidelines for the identification, protection and management*
* "Street Tree" – *Telephone 93779000 or request in writing a street tree (s) be planted*
* "Street Tree Protection"- *building permit requirements.*
* "Crossovers" – *constructed in accordance to Town's specifications*
* "Availability of Mulch" *Free mulch during specified time frames or pay for delivery.*

I/we, agree:

1. ***to maintain the verge area in accordance to the approved permissible verge treatment in a good and tidy condition and ensure that pedestrian access will be maintained.***
2. ***that service utilities on occasions will require access to the verge area to undertake underground, above ground routine work and street tree pruning operations.***
3. ***that if the approved permissible verge treatment is damaged as a result of the routine work, the applicant shall reinstate the area at no cost to the Town of Bassendean.***

Applicant (s) Name .....
Applicant/s Signature .....
Date: .....

Please note that landscaping of verge area shall not be undertaken without written approval that the application is in accordance to the Permissible Verge Treatment requirements

TOWN OF BASSENDEAN
Home by the Swan

Information Sheet

OFFICE USE ONLY

Required Verge Treatment documentation and Plans submitted	☐ Yes ☐ No
Street Tree Protected policy considered & applied	☐ Yes ☐ No
Acceptable materials utilized	☐ Yes ☐ No
Pedestrian Access provided	☐ Yes ☐ No
Existing / Future Street Tree considered	☐ Yes ☐ No

Application ☐ Approved ☐ Refused

Comments:

.....

.....

Officer Title : ..... Date: ..... Applicant advise Yes ☐

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LOCAL GOVERNMENT ACT 1995

TOWN OF BASSENDEAN

ACTIVITIES ON THOROUGHFARES AND TRADING IN THOROUGHFARES AND PUBLIC PLACES LOCAL LAW 2010

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LOCAL GOVERNMENT ACT 1995

TOWN OF BASSENDEAN

ACTIVITIES ON THOROUGHFARES AND TRADING IN THOROUGHFARES AND PUBLIC PLACES LOCAL LAW 2010

Under the powers conferred by the *Local Government Act 1995* and under all other powers enabling it, the Council of the Town of Bassendean resolved on the 23rd November 2010 to adopt the following local law.

PART 1—PRELIMINARY

1.1 Citation

This local law may be cited as the *Town of Bassendean Activities on Thoroughfares and Trading in Thoroughfares and Public Places Local Law 2010*.

1.2 Definitions

In this local law unless the context otherwise requires—

"**Act**" means the *Local Government Act 1995*;

"**applicant**" means a person who applies for a permit;

"**authorised person**" means a person authorised by the local government under section 9.10 of the Act to perform any of the functions of an authorised person under this local law;

"**built-up area**" has the meaning given to it in the *Road Traffic Code 2000*;

"**bulk rubbish container**" means a bin or container designed or used for holding a substantial quantity of rubbish and which is unlikely to be lifted without mechanical assistance, but does not include a bin or container used in connection with the local government's regular domestic rubbish or recycling collection service;

"**carriageway**" has the meaning given to it in the *Road Traffic Code 2000*;

"**CEO**" means the Chief Executive Officer of the local government;

"**commencement day**" means the day on which this local law comes into operation;

"**Council**" means the council of the local government;

"**crossing**" means a crossing giving access from a public thoroughfare to—

(a) private land; or

(b) a private thoroughfare serving private land;

"**district**" means the district of the local government;

"**footpath**" has the meaning given to it in the *Road Traffic Code 2000*;

"**garden**" means any part of a thoroughfare planted, developed or treated, otherwise than as a lawn, with one or more plants;

"**intersection**" has the meaning given to it in the *Road Traffic Code 2000*;

"**kerb**" includes the edge of a carriageway;

"**lawn**" means any part of a thoroughfare which—

(a) is planted, by any person, only with grass, or with a similar plant; or

(b) is planted, by the local government, with any other plant;

"**liquor**" has the meaning given to it in section 3 of the *Liquor Control Act 1988*;

"**local government**" means the Town of Bassendean;

"**local government property**" means anything except a thoroughfare—

(a) which belongs to the local government;

(b) of which the local government is the management body under the *Land Administration Act 1997*; or

(c) which is an "otherwise unvested facility" within section 3.53 of the Act;

"**lot**" has the meaning given to it in the *Planning and Development Act 2005*;

"**owner**" or "**occupier**" in relation to land does not include the local government;

"**permissible verge treatment**" means a treatment described in clause 2.7(2), and includes any reticulation pipes and sprinklers installed for the purposes of the treatment;

"**permit**" means a permit issued under this local law;

"**permit holder**" means a person who holds a valid permit;

"**person**" does not include the local government;

"**premises**" for the purpose of the definition of "public place" in both this clause and clause 6.1, means a building or similar structure, but does not include a carpark or a similar place;

"**public place**" includes any thoroughfare or place which the public are allowed to use, whether or not the thoroughfare or place is on private property, but does not include—

(a) premises on private property from which trading is lawfully conducted under a written law; and

(b) local government property;

"**regulations**" mean the *Local Government (Functions and General) Regulations 1996*;

"**sign**" includes a notice, flag, mark, structure or device on which may be shown words, numbers, expressions or symbols;

"**thoroughfare**" has the meaning given to it in the Act, but does not include a private thoroughfare which is not under the management or control of the local government;

"**town planning scheme**" means a town planning scheme of the local government made under the *Planning and Development Act 2005*;

"**townsite**" means the townsite of the local government which is—

(a) constituted under section 26(2) of the *Land Administration Act 1997*; or

(b) referred to in clause 37 of Schedule 9.3 of the Act;

"**vehicle**" includes—

(a) every conveyance and every object capable of being propelled or drawn on wheels, tracks or otherwise; and

(b) an animal being ridden or driven,

but excludes—

(a) a wheel-chair or any device designed for use by a physically impaired person on a footpath; and

(b) a pram, a stroller or a similar device; and

"**verge**" means that part of a thoroughfare between the carriageway and the land which abuts the thoroughfare, but does not include any footpath.

1.3 Application

This local law applies throughout the district.

1.4 Repeal

(1) The *Town of Bassendean Activities on Thoroughfares and Trading in Thoroughfares and Public Places Local Law* published in the *Government Gazette* on 16 August 2001 is repealed.

(2) Where a policy was made or adopted by the local government under or in relation to a local law repealed by this local law, then the policy is to be taken to no longer have any effect on and from the commencement day.

(3) The Council may resolve that notwithstanding subclause (2) specified policies continue, or are to be taken to have continued, to have effect on and from the commencement day.

PART 2—ACTIVITIES ON THOROUGHFARES AND PUBLIC PLACES

Division 1—General

2.1 General prohibitions

A person must not—

(a) plant any plant except grass within 6m of an intersection;

(b) damage a lawn or a garden or remove any plant or part of a plant from a lawn or a garden in a thoroughfare or public place unless—

(i) the person is the owner or the occupier of the lot abutting that portion of the thoroughfare and the lawn or the garden or the particular plant has not been installed or planted by the local government; or

(ii) the person is acting under the authority of a written law;

(c) place, or allow to be placed or remain, on a thoroughfare or verge any thing (except water) that—

(i) obstructs the thoroughfare or verge; or

(ii) results in a hazard for any person using the thoroughfare or verge;

(d) unless at the direction of the local government, damage, remove or interfere with any signpost, direction plate, guidepost, notice, shelter, shed, fence or any structure erected on a thoroughfare by the local government or a person acting under the authority of a written law;

(e) play or participate in any game or sport so as to cause danger to any person or thing or impede the movement of vehicles or persons on a thoroughfare;

(f) within a mall, arcade or veranda of a shopping centre, ride any skateboard, rollerblades, bicycles, scooters or similar device; or

(g) remove or kill by felling, poison or any other means a tree on a verge area or thoroughfare or verge unless the person is—

(i) acting under authority of a permit issued by the local government; or

(ii) a local government employee or contractor engaged by the local government to undertake work in relation to a particular tree or trees on thoroughfares in the district or on local government property generally; or

(iii) acting under authority of a written law.

2.2 Activities allowed with a permit—general

(1) A person shall not, without a permit—

(a) dig or otherwise create a trench through or under a kerb or footpath;

(b) subject to Division 3 of this Part, throw, place or deposit any thing on a verge except for removal by the local government under a bulk rubbish collection, and then only during the period of time advertised in connection with that collection by the local government;

(c) cause any obstruction to a vehicle or a person using a thoroughfare as a thoroughfare;

(d) cause any obstruction to a water channel or a water course in a thoroughfare;

(e) throw, place or drain offensive, noxious or dangerous fluid onto a thoroughfare;

(f) damage a thoroughfare, kerb or footpath;

(g) light any fire or burn any thing on a thoroughfare other than in a stove or fireplace provided for that purpose;

(h) fell any tree onto a thoroughfare;

(i) unless installing, or in order to maintain, a permissible verge treatment—

(i) lay pipes under or provide taps on any verge; or

(ii) place or install any thing on any part of a thoroughfare, including gravel, stone, flagstone, cement, concrete slabs, blocks, bricks, pebbles, plastic sheeting, kerbing, wood chips, bark or sawdust;

(j) provide, erect, install or use in or on any building, structure or land abutting on a thoroughfare any hoist or other thing for use over the thoroughfare;

(k) on a public place use anything or do anything so as to create a nuisance;

(l) place or cause to be placed on a thoroughfare a bulk rubbish container;

(m) interfere with the soil of, or anything in a thoroughfare or take anything from a thoroughfare;

(n) prune or lop a tree on a verge or in a thoroughfare unless that person is—

(i) a local government employee or contractor engaged by the local government to undertake work in relation to a particular tree or trees on thoroughfares in the district or on local government property generally; or

(ii) acting under authority of a written law;

(o) plant or sow any seeds in a thoroughfare;

(p) clear or maintain in a cleared state, the surface of a thoroughfare within 1m of that person's land; or

(q) construct a firebreak on a thoroughfare.

(2) The local government may exempt a person from compliance with subclause (1) on the application of that person.

2.3 No possession and consumption of liquor on thoroughfare

(1) A person shall not consume any liquor or have in her or his possession or under her or his control any liquor on a thoroughfare unless—

(a) that is permitted under the *Liquor Control Act 1988* or under another written law; or

(b) the person is doing so in accordance with a permit;

(2) Subclause (1) does not apply where the liquor is in a sealed container.

Division 2—Vehicle Crossings

2.4 Temporary Crossings

(1) Where it is likely that works on a lot will involve vehicles leaving a thoroughfare and entering the lot, the person responsible for the works must obtain a permit for the construction of a temporary crossing to protect the existing carriageway, kerb, drains and footpath, where—

(a) a crossing does not exist; or

(b) a crossing does exist, but the nature of the vehicles and their loads is such that they are likely to cause damage to the crossing.

(2) The "person responsible for the works" in subclause (1) is to be taken to be—

(a) the builder named on the building licence issued under the *Local Government (Miscellaneous Provisions) Act 1960*, if one has been issued in relation to the works; or

(b) the registered proprietor of the lot, if no building licence has been issued under the *Local Government (Miscellaneous Provisions) Act 1960* in relation to the works.

(3) If the local government approves an application for a permit for the purpose of subclause (1), the permit is taken to be issued on the condition that until such time as the temporary crossing is removed, the permit holder shall keep the temporary crossing in good repair and in such a condition so as not to create any danger or obstruction to persons using the thoroughfare.

2.5 Removal of redundant crossing

(1) Where works on a lot will result in a crossing no longer giving access to a lot, the crossing is to be removed and the kerb, drain, footpath, verge and any other part of the thoroughfare affected by the removal are to be reinstated to the satisfaction of the local government.

(2) The local government may give written notice to the owner or occupier of a lot requiring her or him to—

(a) remove any part of or all of a crossing which does not give access to the lot; and

(b) reinstate the kerb, drain, footpath, verge and any other part of the thoroughfare, which may be affected by the removal,

within the period of time stated in the notice, and the owner or occupier of the lot shall comply with that notice.

Division 3—Verge Treatments

2.6 Interpretation

In this Division, unless the context otherwise requires—

"**acceptable material**" means any material which will create a hard surface, and which appears on a list of acceptable materials maintained by the local government.

2.7 Permissible verge treatments

(1) An owner or occupier of land, which abuts on a verge, may on that part of the verge directly in front of her or his land install a permissible verge treatment.

(2) The permissible verge treatments are—

(a) the planting and maintenance of a lawn;

(b) the planting and maintenance of a garden provided that—

(i) clear sight visibility is maintained at all times for a person using the abutting thoroughfare in the vicinity of an intersection or bend in the thoroughfare or using a driveway on land adjacent to the thoroughfare for access to or from the thoroughfare;

(ii) where there is no footpath, a pedestrian has safe and clear access of a minimum width of 2m along that part of the verge immediately adjacent to the kerb;

(iii) it does not include a wall or built structure; and

(iv) it is not of a thorny, poisonous or hazardous nature; or

(c) the installation of an acceptable material; or

(d) the installation of an acceptable material or other verge treatment in accordance with paragraph (c), and the planting and maintenance of either a lawn or a garden on the balance of the verge in accordance with paragraph (a) or (b).

2.8 Only permissible verge treatments to be installed

(1) A person shall not install or maintain a verge treatment that is not a permissible verge treatment.

(2) The owner and occupier of the lot abutting a verge treatment referred to in subclause (1) are each to be taken to have installed and maintained that verge treatment for the purposes of this clause and clause 2.9.

2.9 Obligations of owner or occupier

An owner or occupier who installs or maintains a permissible verge treatment must—

(a) keep the permissible verge treatment in a good and tidy condition and ensure, where the verge treatment is a garden or lawn, that a footpath on the verge and a carriageway adjoining the verge is not obstructed by the verge treatment;

(b) ensure the verge treatment does not cause a sight distance obstruction to any person using a footpath on the verge or a carriageway or crossing adjoining the verge or in proximity to it;

(c) not place any obstruction on or around the verge treatment;

(d) not disturb a footpath on the verge;

(e) ensure that the verge treatment does not damage or obstruct a drain, manhole, gully, inspection pit, channel, kerb, or tree planted by the local government; and

(f) ensure that any sprinklers or pipes installed to irrigate a verge treatment—

(i) do not protrude above the level of the lawn when not in use;

(ii) are not used at such times so as to cause unreasonable inconvenience to pedestrians or other persons; and

(iii) do not otherwise present a hazard to pedestrians or other persons.

2.10 Notice to owner or occupier

The local government may give a notice in writing to the owner or the occupier of a lot abutting on a verge to make good, within the time specified in the notice, any breach of a provision of this Division.

2.11 Transitional provision

(1) In this clause—

"**former provisions**" means one or more of the provisions on a repealed local law which permitted certain types of verge treatments; and

"**repealed local law**" means the local law that is repealed by clause 1.4. without the consent of the local government.

(2) A verge treatment which—

(a) was installed prior to the commencement day; and

(b) on the commencement day is a type of verge treatment which was permitted under and complied with the former provisions, is to be taken to be a permissible verge treatment for so long as the verge treatment remains of the same type and continues to comply with the former provisions.

2.12 Power to carry out public works on verge

Where the local government or an authority empowered to do so under a written law disturbs a verge, the local government or the authority—

(a) is not liable to compensate any person for that disturbance;

(b) may backfill with sand, if necessary, any garden or lawn; and

(c) is not liable to replace or restore any—

(i) verge treatment and, in particular, any plant or any acceptable material or other hard surface; or

(ii) sprinklers, pipes or other reticulation equipment.

Division 4—Property Numbers

2.13 Interpretation

In this Division, unless the context requires otherwise—

"**number**" means a number of a lot with or without an alphabetical suffix indicating the address of the lot by reference to a thoroughfare.

2.14 Assignment of numbers

The local government may assign a number to a lot in the district and may assign another number to the lot instead of that previously assigned.

Division 5—Fencing

2.15 Public place—clause 4(1) of Division 1, Schedule 3.1 of Act

Each of the following places are specified as a public place for the purpose of item 4(1) of Division 1 of Schedule 3.1 of the Act—

(a) a public place, as that term is defined in clause 1.2; and

(b) local government property.

Division 6—Signs Erected by the Local Government

2.16 Signs

(1) A local government may erect a sign on a public place specifying any conditions of use which apply to that place.

(2) A person shall comply with a sign erected under subclause (1).

(3) A condition of use specified on a sign erected under subclause (1) is to be for the purpose of giving notice of the effect of a provision of this local law.

2.17 Transitional

Where a sign erected on a public place has been erected under a local law of the local government repealed by this local law, then on and from the commencement day, it is to be taken to be a sign erected under clause 2.16 if—

(a) the sign specifies a condition of use relating to the public place which gives notice of the effect of a provision of this local law; and

(b) the condition of use specified is not inconsistent with any provision of this local law.

Division 7—Driving on a Closed Thoroughfare

2.18 No driving on closed thoroughfare

(1) In this clause—

"**closed thoroughfare**" means a thoroughfare wholly or partially closed under section 3.50 or 3.50A of the Act.

(2) A person shall not drive or take a vehicle on a closed thoroughfare unless—

(a) that is in accordance with any limits or exceptions specified in the order made under section 3.50 of the Act; or

(b) the person has first obtained a permit.

PART 3—ADVERTISING SIGNS ON THOROUGHFARES

Division 1—Preliminary

3.1 Interpretation

In this Part, unless the context otherwise requires—

"**advertising sign**" means a sign used for the purpose of advertising a business, organisation, person, service, product or event and includes an "election sign";

"**direction sign**" means a sign used to provide direction to another place where an activity or event is taking place, but does not include any such sign erected or affixed by the local government or the Commissioner of Main Roads;

"**infrequent or occasional**" means a one off or annual occurrence; and

"**portable sign**" means a portable free standing advertising sign or direction sign which is not placed on or affixed to any natural feature, including a rock or tree, or on any structure located within a thoroughfare.

Division 2—Permit

3.2 Portable advertising signs and portable direction signs

(1) A person shall not—

(a) erect or place an advertising sign or direction sign on any part of a thoroughfare without the prior approval of the local government; and

(b) place a sign of any other description on any part of a thoroughfare.

(2) Notwithstanding subclause (1), a permit is not required in respect of a portable direction sign which complies with the following—

(a) the sign does not exceed 500mm in height or 0.5m^2 in area;

(b) the sign is placed on a thoroughfare on an infrequent or occasional basis only to direct attention to a place where an activity or event is occurring, during the hours of that activity or event;

(c) the number of portable direction signs providing direction to the place where the activity or event is occurring shall not exceed 4 in total;

(d) the sign shall use symbols and lettering of a sufficient size so as to be clearly legible when observed from a distance;

(e) the content of the sign shall be limited to advertising an activity or event and providing direction to its location;

(f) the sign shall only be placed for the duration of the activity or event to which the sign relates;

(g) the sign shall be secured while placed so as to not become a hazard, particularly when subject to wind loads;

(h) the sign shall not be placed on a footpath;

(i) the sign shall not be placed within 1m of a vehicle carriageway and a carriageway will be deemed to include a parking bay; and

(j) the sign shall not be placed in any other location where, in the opinion of the local government, the sign is likely to obstruct sight lines along a thoroughfare or cause danger to any person using the thoroughfare.

(3) Notwithstanding subclause (1), a permit is not required in respect of a portable advertising sign which complies with the following—

(a) the sign does not exceed 1m in height or 1m^2 in area;

(b) the sign shall use symbols and lettering of a sufficient size so as to be clearly legible when observed from a distance;

(c) the content of the sign shall be limited to advertising a business, organisation, person, service, product or event;

(d) the sign shall be the only portable advertising sign serving the building, property or business to which the sign relates (1 sign per business/property/building);

(e) the sign shall only be placed during the business hours to which the sign relates;

(f) the sign shall be secured while placed so as to not become a hazard, particularly when subject to wind loads;

(g) the sign shall, in all instances, be located directly adjacent to the building, property or business to which the sign relates;

(h) the sign shall not be placed on a footpath;

(i) not withstanding subclause (3)(h), the sign may be placed on a footpath if the verge adjoining the building, property or business to which the sign relates consists only of a footpath. In this instance the sign must be—

(i) located within a trading zone or alfresco dining zone if one has been approved for the subject property; or

(ii) where a trading zone or alfresco dining zone has not been approved for the subject property the sign must be placed such that it abuts the property's front boundary; and

(iii) the placement of a sign on a footpath must not reduce the footpaths effective width for use by pedestrians to a distance less than 1.8m.

(j) the sign shall not be placed within 1m of a vehicle carriageway and a carriageway will be deemed to include a parking bay;

(k) the sign shall not be placed in any other location where, in the opinion of the local government, the sign is likely to obstruct sight lines along a thoroughfare or cause danger to any person using the thoroughfare; and

(l) the sign owner must maintain public liability insurance cover to a level agreed to by the local government. A copy of the insurance must be provided to the Town on an annual basis, or such other time as required by the Town, as evidence that the insurance cover has been renewed.

3.3 General Discretion

(1) Notwithstanding other sections in this local law, the local government may consent to the placement of a sign that does not comply with a requirement or standard of this local law.

(2) In determining whether to grant its approval to the placement of any sign, the local government may consider, in addition to any other matter, whether the placement of the sign would have an adverse affect on—

(a) the safe or convenient use of any land; or

(b) the safety or convenience of any person.

PART 4—OBSTRUCTING ANIMALS, VEHICLES OR SHOPPING TROLLEYS

Division 1—Animals and Vehicles

4.1 Leaving an animal or vehicle in a public place or on local government property

(1) A person shall not leave an animal or a vehicle, or any part of a vehicle, in a public place or on local government property so that it obstructs the use of any part of that public place or local government property, unless that person has first obtained a permit or is authorised to do so under a written law.

(2) Subject to any other local law, a person does not contravene subclause (1) where the animal is secured or tethered for a period not exceeding 1 hour.

(3) Subject to any other local law, a person will not contravene subclause (1) where the vehicle is left for a period not exceeding 24 hours.

4.2 Prohibitions relating to animals

(1) In subclause (2), "**owner**" in relation to an animal includes—

(a) an owner of the animal;

(b) a person who has the animal in his or her possession or under his or her control; and

(c) the occupier of any premises where the animal is ordinarily kept or ordinarily permitted to live.

(2) An owner of an animal shall not—

(a) allow the animal to enter or remain for any time on any thoroughfare except for the use of the thoroughfare as a thoroughfare and unless it is led, ridden or driven;

(b) allow the animal which has a contagious or infectious disease to be led, ridden or driven in a public place;

(c) train or race the animal on a thoroughfare; or

(d) subject to subclause (4), allow the animal to defecate on a thoroughfare.

(3) An owner of a horse shall not lead, ride or drive a horse on a thoroughfare in a built-up area, unless that person does so under a permit or under the authority of a written law.

(4) An owner of an animal does not commit an offence if the defecation is immediately removed.

4.3 Removal of vehicle or animal

An authorised person may impound an animal or vehicle left in contravention of clause 4.1

Division 2—Shopping Trolleys

4.4 Interpretation

In this Division—

"**retailer**" means a proprietor of a shop in respect of which shopping trolleys are provided for the use of customers of the shop; and

"**shopping trolley**" means a wheeled container or receptacle supplied by a retailer to enable a person to transport goods.

4.5 Shopping trolley to be marked

A retailer shall clearly mark its name or its trading name on any shopping trolley made available for the use of customers.

4.6 Person not to leave trolley in public place

A person shall not leave a shopping trolley in a public place or on local government property other than in an area set aside for the storage of shopping trolleys.

4.7 Retailer to remove abandoned trolley

(1) If a shopping trolley is found in a public place or on local government property, other than in an area set aside for the storage of shopping trolleys, the local government may advise (verbally or in writing) a retailer whose name is marked on the trolley of the location of the shopping trolley.

(2) A retailer shall remove a shopping trolley within 24 hours of being so advised under subclause (1).

4.8 Retailer taken to own trolley

In the absence of any proof to the contrary, a shopping trolley is to be taken to belong to a retailer whose name is marked on the trolley.

4.9 Impounding of abandoned trolley

An authorised person may impound a shopping trolley that is—

(a) left on a thoroughfare, verge or local government property that is not marked in accordance with clause 4.5; or

(b) not removed by a retailer after having been so advised under clause 4.7(2).

PART 5—TRADING IN THOROUGHFARES AND PUBLIC PLACES

Division 1—Stallholders and Traders

5.1 Interpretation

In this Division, unless the context otherwise requires—

"**public place**" includes—

(a) any thoroughfare or place which the public are allowed to use whether or not the thoroughfare or place is on private property; and

(b) local government property, but does not include premises on private property from which trading is lawfully conducted under a written law.

"**stall**" means a movable or temporarily fixed structure, stand, table or vehicle in, on or from which goods or services are sold, hired or offered for sale or hire;

"**stallholder**" means a person in charge of a stall;

"**stallholder's permit**" means a permit issued to a stallholder;

"**trader**" means a person who carries on trading;

"**trader's permit**" means a permit issued to a trader; and

"**trading**" includes—

(a) the selling or hiring of, the offering for sale or hire of or the soliciting of orders for goods or services in a public place;

(b) displaying goods in any public place for the purpose of—

(i) offering them for sale or hire;

(ii) inviting offers for their sale or hire;

(iii) soliciting orders for them; or

(iv) carrying out any other transaction in relation to them.

5.2 Stallholder's permit

A person shall not conduct a stall on a public place unless that person is—

(a) the holder of a valid stallholder's permit; or

(b) an assistant specified in a valid stallholder's permit.

5.3 Trader's permit

A person shall not carry on trading unless that person is—

(a) the holder of a valid trader's permit; or

(b) an assistant specified in a valid trader's permit.

5.4 No permit required to sell newspaper

Despite any other provision of this local law, a person who sells, or offers for sale, a newspaper is not required to obtain a permit.

5.5 Conduct of stallholders and traders

(1) A stallholder while conducting a stall or a trader while trading, must—

(a) display her or his permit in a conspicuous place on the stall, vehicle or temporary structure or, if there is no stall, vehicle or temporary structure, carry the permit with him or her while conducting a stall or trading;

(b) not display a permit unless it is a valid permit; and

(c) when selling goods by weight, carry and use for that purpose, scales tested and certified in accordance with the provisions of the *Trade Measurement Administration Act 2006*.

(2) A stallholder or trader must not—

(a) deposit or store any thing or any part of a thoroughfare so as to obstruct the movement of pedestrians or vehicles;

(b) act in an offensive manner; or

(c) use or cause to be used any apparatus or device, including any flap or shelf, whereby the dimensions of a stall, vehicle or structure are increased beyond those specified in the permit.

Division 2—Street entertainers

5.6 Interpretation

In this Division, unless the context otherwise requires—

"**perform**" includes to play a musical instrument, sing, mime, dance, give an acrobatic or aerobic display or entertain, but does not include public speaking;

"**permit**" means a permit issued for the purpose of clause 5.7;

"**permitted area**" means the area or areas, specified in a permit, in which the permit holder may perform; and

"**permitted time**" means the time or times, specified in a permit, during which the permit holder may perform.

5.7 Permit required to perform

A person shall not perform in a public place without a permit.

5.8 Variation of permitted area and permitted time

(1) The local government may by notice in writing to a permit holder vary—

(a) the permitted area;

(b) the permitted time; or

(c) both the permitted area and the permitted time,

shown on a permit.

(2) The local government may direct a permit holder to move from one permitted area to another permitted area, if more than one area is specified in a permit.

5.9 Duration of permit

A permit is valid for a period of 3 months after the date on which it is issued unless it is sooner cancelled under this local law.

5.10 Cancellation of permit

The local government may cancel a permit, if in the opinion of an authorised person—

(a) the volume of sound caused by the permit holder in connection with the performance adversely affects the enjoyment, convenience or comfort of other persons in a public place; or

(b) the performance otherwise constitutes a nuisance.

Division 3—Outdoor Eating Facilities on Public Places

5.11 Interpretation

In this Division—

"**facility**" means an outdoor eating facility or establishment on any part of a public place, but does not include such a facility or establishment on private land;

"**permit holder**" means the person to whom a permit has been issued for the purpose of clause 5.12; and

"**public place**" has the meaning given to it in clause 5.1.

5.12 Permit required to conduct facility

A person shall not establish or conduct a facility without a permit.

5.13 Removal of facility unlawfully conducted

Where a facility is conducted without a permit, or in contravention of a condition of a permit, any tables, chairs, umbrellas or other equipment may be removed by an authorised person and impounded in accordance with the Act.

5.14 Temporary removal of facility may be requested

(1) The permit holder for a facility is to temporarily remove the facility when requested to do so on reasonable grounds by an authorised person or a member of the Police Service or an emergency service.

(2) The permit holder may replace the facility removed under subclause (1) as soon as the person who directed her or him to remove it allows it to be replaced.

PART 6—PERMITS

Division 1—Applying for a permit

6.1 Application for permit

(1) Where a person is required to obtain a permit under this local law, that person must apply for the permit in accordance with subclause (2).

(2) An application for a permit under this local law must—

(a) be in the form determined by the local government;

(b) be signed by the applicant;

(c) provide the information required by the form;

(d) contain other information required, for that particular type of permit, under this local law; and

(e) be forwarded to the CEO together with any fee imposed and determined by the local government under and in accordance with sections 6.16 to 6.19 of the Act.

(3) The local government may require an applicant to provide additional information reasonably related to an application before determining an application for a permit.

(4) The local government may require an applicant to give local public notice of the application for a permit.

(5) The local government may refuse to consider an application for a permit which is not in accordance with subclause (2).

6.2 Decision on application for permit

(1) The local government may—

(a) approve an application for a permit unconditionally or subject to any conditions; or

(b) refuse to approve an application for a permit.

(2) If the local government approves an application for a permit, it is to issue to the applicant a permit in the form determined by the local government.

(3) If the local government refuses to approve an application for a permit, it is to give written notice of that refusal to the applicant.

(4) Where a clause of this local law refers to conditions which may be imposed on a permit or which are to be taken to be imposed on a permit, the clause does not limit the power of the local government to impose other conditions on the permit under subclause (1)(a).

(5) Where a clause of this local law refers to the grounds on which an application for a permit may be or is to be refused, the clause does not limit the power of the local government to refuse the application for a permit on other grounds under subclause (1)(b).

6.3 Relevant considerations in determining application for permit

(1) In determining an application for a permit, the local government is to have regard to—

(a) any relevant policy of the local government;

(b) the desirability of the proposed activity;

(c) the location of the proposed activity; and

(d) such other matters as the local government may consider to be relevant in the circumstances of the case.

(2) The local government may refuse to approve an application for a permit on any one or more of the following grounds—

(a) that the applicant has committed a breach of any provision of this local law or of any written law relevant to the activity in respect of which the permit is sought;

(b) that the applicant is not a desirable or suitable person to hold a permit; or

(c) such other grounds as the local government may consider to be relevant in the circumstances of the case.

Division 2—Conditions

6.4 Conditions which may be imposed on a permit

The local government may approve an application for a permit subject to conditions relating to—

(a) the payment of a fee;

(b) the duration and commencement of the permit;

(c) the commencement of the permit being contingent on the happening of an event;

(d) the rectification, remedying or restoration of a situation or circumstance reasonably related to the application;

(e) the approval of another application for a permit which may be required by the local government under any written law;

(f) the area of the district to which the permit applies;

(g) where a permit is issued for an activity which will or may cause damage to a public place, the payment of a deposit or bond against such damage;

(h) the obtaining of public risk insurance in an amount and on terms reasonably required by the local government; and

(i) the provision of an indemnity from the permit holder indemnifying the local government in respect of any injury to any person or any damage to any property which may occur in connection with the use of the public place by the permit holder.

6.5 Imposing conditions under a policy

(1) In this clause—

"**policy**" means a policy of the local government adopted by the Council containing conditions subject to which an application for a permit may be approved under clause 6.2(1)(a).

(2) Under clause 6.2(1)(a) the local government may approve an application subject to conditions by reference to a policy.

(3) The local government is to give a copy of the policy, or the part of the policy which is relevant to the application for a permit, with the form of permit referred to in clause 6.2(2).

(4) An application for a permit is to be taken not to have been approved subject to the conditions contained in a policy until the local government gives the permit holder a copy of the policy or the part of the policy which is relevant to the application.

(5) Sections 5.94 and 5.95 of the Act shall apply to a policy and for that purpose a policy is to be taken to be information within section 5.94(u)(i) of the Act.

6.6 Compliance with and variation of conditions

(1) Where an application for a permit has been approved subject to conditions, or where a permit is to be taken to be subject to conditions under this local law, the permit holder shall comply with each of those conditions.

(2) The local government may vary the conditions of a permit, and the permit holder shall comply with those conditions as varied.

Division 3—General

6.7 Duration of permit

A permit is valid for one year from the date on which it is issued, unless it is—

(a) otherwise stated in this local law or in the permit; or

(b) cancelled under clause 6.11.

6.8 Renewal of permit

(1) A permit holder may apply to the local government in writing prior to expiry of a permit for the renewal of the permit.

(2) The provisions of—

(a) this Part; and

(b) any other provision of this local law relevant to the permit which is to be renewed,

apply, with appropriate modifications to an application for the renewal of a permit.

6.9 Transfer of permit

(1) An application for the transfer of a valid permit is to—

(a) be made in writing;

(b) be signed by the permit holder and the proposed transferee of the permit;

(c) provide such information as the local government may require to enable the application to be determined; and

(d) be forwarded to the CEO together with any fee imposed and determined by the local government under and in accordance with sections 6.16 to 6.19 of the Act.

(2) The local government may approve an application for the transfer of a permit, refuse to approve it or approve it subject to any conditions.

(3) Where the local government approves an application for the transfer of a permit, the transfer may be effected by—

(a) an endorsement on the permit signed by the CEO or an authorised person; or

(b) issuing to the transferee a permit in the form determined by the local government.

(4) Where the local government approves an application for the transfer of a permit, it is not required to refund any part of any fee paid by the former permit holder.

6.10 Production of permit

A permit holder is to produce to an authorised person his or her permit immediately on being required to do so by that authorised person.

6.11 Cancellation of permit

(1) Subject to clause 8.1, a permit may be cancelled by the local government if the permit holder has not complied with—

(a) a condition of the permit; or

(b) a provision of any written law which may relate to the activity regulated by the permit.

(2) If a permit is cancelled the permit holder—

(a) shall return the permit as soon as practicable to the local government; and

(b) is to be taken to have forfeited any fees paid in respect of the permit.

6.12 Nominee of permit holder

Where a permit holder by reason of illness, accident or other sufficient cause is unable to comply with this local law, the local government may at the request of that permit holder authorise another person to be a nominee of the permit holder for a specified period, and this local law and the conditions of the permit apply to the nominee as if he or she was the permit holder.

PART 7—OBJECTIONS AND APPEALS

7.1 Application of Part 9 Division 1 of Act

The provisions of Division 1 of Part 9 of the Act and regulation 33 of the Regulations apply to any local government decision.

(a) to impose conditions on a permit;

(b) to vary a permit; or

(c) not to renew or cancel a permit.

PART 8—NOTICES

8.1 Notice to redirect or repair sprinkler

Where a lawn or a garden is being watered with a sprinkler which is on the lawn or the garden, in a manner which causes or may cause an inconvenience or obstruction to any person or vehicle using a thoroughfare, the local government may give a notice to the owner or the occupier of the land abutting the lawn or the garden, requiring the owner or the occupier or both to move or alter the direction of the sprinkler or other watering equipment.

8.2 Hazardous plants

(1) Where a plant in a garden creates or may create a hazard for any person using a thoroughfare, the local government may give a notice to the owner or the occupier of the land abutting the garden to remove, cut, move or otherwise deal with that plant so as to remove the hazard;

(2) Subclause (1) does not apply where the plant was planted by the local government.

8.3 Damage to thoroughfare

Where any portion of a thoroughfare, kerb or footpath has been damaged, the local government may by notice to the person who caused the damage order the person to repair or replace that portion of the thoroughfare to the satisfaction of the local government.

8.4 Notice to remove thing unlawfully placed on thoroughfare

Where any thing is placed on a thoroughfare in contravention of this local law, the local government may by notice in writing to the owner or the occupier of the property which abuts that portion of the thoroughfare where the thing has been placed, or such other person who may be responsible for the thing being so placed, require the relevant person to remove the thing.

PART 9—ENFORCEMENT

Division 1—Notices Given Under This Local Law

9.1 Offence to fail to comply with notice

Whenever the local government gives a notice under this local law requiring a person to do any thing, if the person fails to comply with the notice, the person commits an offence.

9.2 Local government may undertake requirements of notice

Where a person fails to comply with a notice referred to in clause 9.1, the local government may do the thing specified in the notice and recover from that person, as a debt, the costs incurred in so doing.

Division 2—Offences and Penalties

9.3 Offences

(1) Any person who fails to do anything required or directed to be done under this local law, or who does anything which under this local law that person is prohibited from doing, commits an offence.

(2) Any person who commits an offence under this local law is liable, upon conviction, to a penalty not exceeding $5,000, and if the offence is of a continuing nature, to an additional penalty not exceeding $500 for each day or part of a day during which the offence has continued.

9.4 Prescribed offences

(1) An offence against a clause specified in Schedule 1 is a prescribed offence for the purposes of section 9.16(1) of the Act.

(2) The amount of the modified penalty for a prescribed offence is that specified adjacent to the clause in Schedule 1.

(3) For the purpose of guidance only, before giving an infringement notice to a person in respect of the commission of a prescribed offence, an authorised person should be satisfied that—

(a) commission of the prescribed offence is a relatively minor matter; and

(b) only straightforward issues of law and fact are involved in determining whether the prescribed offence was committed, and the facts in issue are readily ascertainable.

9.5 Forms

Unless otherwise specified, for the purposes of this local law—

(a) where a vehicle is involved in the commission of an offence, the form of the notice referred to in section 9.13 of the Act is that of Form 1 in Schedule 1 of the Regulations;

(b) the form of the infringement notice given under section 9.16 of the Act is that of Form 2 in Schedule 1 of the Regulations; and

(c) the form of the notice referred to in section 9.20 of the Act is that of Form 3 in Schedule 1 of the Regulations.

First Schedule

Local Government Act 1995

Town of Bassendean

ACTIVITIES ON THOROUGHFARES AND TRADING IN THOROUGHFARES AND PUBLIC PLACES LOCAL LAW 2010

PRESCRIBED OFFENCES

Clause	Description	Modified Penalty $
2.1(a)	Plant of 0.75m in height on thoroughfare within 6m of intersection	125
2.1(b)	Damaging lawn or garden	125
2.1(c)	Obstructing or causing a hazard on thoroughfare or verge	200
2.1(d)	Damaging or interfering with thoroughfare structure	350
2.1(e)	Playing games so as to impede vehicles or persons on thoroughfare	125
2.1(f)	Riding of skateboard or similar device on mall or veranda of shopping centre	125
2.1(g)	Removal of tree on thoroughfare or verge	350
2.2(1)(a)	Digging a trench through a kerb or footpath without a permit	200
2.2(1)(b)	Throwing or placing anything on a verge without a permit	200
2.2(1)(c)	Causing obstruction to vehicle or person on thoroughfare without a permit	200
2.2(1)(d)	Causing obstruction to water channel on thoroughfare without a permit	250
2.2(1)(e)	Placing or draining offensive fluid on thoroughfare without a permit	250
2.2(1)f)	Damage a thoroughfare, kerb or footpath	250
2.2(1)(g)	Lighting a fire on a thoroughfare without a permit	350
2.2(1)(h)	Felling tree onto thoroughfare without a permit	200
2.2(1)(i)	Installing pipes or stone on thoroughfare without a permit	200
2.2(1)(j)	Installing a hoist or other thing on a structure or land for use over a thoroughfare without a permit	350
2.2(1)(k)	Creating a nuisance on a thoroughfare without a permit	200
2.2(1)(l)	Placing a bulk rubbish container on a thoroughfare without a permit	200
2.2(1)(m)	Interfering with anything on a thoroughfare without a permit	200
2.2(1)(n)	Prune or lop a tree without a permit	250
2.2(1)(o)	Plant or sow any seeds on a thoroughfare without a permit	125
2.2(1)(p)	Clear the surface of a thoroughfare without a permit	200
2.2(1)(q)	Construct a firebreak on a thoroughfare without a permit	250
2.3(1)	Consumption or possession of liquor on thoroughfare	125
2.4(1)	Failure to obtain permit for temporary crossing	250
2.5(2)	Failure to comply with notice to remove crossing and reinstate kerb	350
2.8(1)	Installation of verge treatment other than permissible verge treatment	250
2.9	Failure to maintain permissible verge treatment or placement of obstruction on verge	200
2.10	Failure to comply with notice to rectify default	200
2.16(2)	Failure to comply with sign on public place	125
2.18(2)	Driving or taking a vehicle on a closed thoroughfare	350
3.2(1)	Placing advertising sign or affixing any advertisement on a thoroughfare without a permit	125
3.2(3)	The erection or placing of a portable directional sign contrary to the local law	125
4.1(1)	Animal or vehicle obstructing a public place or local government property	125
4.2(2)(a)	Animal on thoroughfare when not led, ridden or driven	125

Clause	Description	Modified Penalty $
4.2(2)(b)	Animal on public place with infectious disease	125
4.2(2)(c)	Training or racing animal on thoroughfare in built-up area	125
4.2(2)(d)	Allow a animal to defecate on a throughfare	125
4.2(3)	Horse led, ridden or driven on thoroughfare in built-up area	125
4.6	Person leaving shopping trolley in public place other than trolley bay	125
4.7(2)	Failure to remove shopping trolley upon being advised of location	125
5.2	Conducting of stall in public place without a permit	350
5.3	Trading without a permit	350
5.5(1)(a)	Failure of stallholder or trader to display or carry permit	125
5.5(1)(b)	Stallholder or trader not displaying valid permit	125
5.5(1)(c)	Stallholder or trader not carrying certified scales when selling goods by weight	125
5.5(2)	Stallholder or trader engaged in prohibited conduct	125
5.7	Performing in a public place without a permit	125
5.8(2)	Failure of performer to move onto another area when directed	125
5.12	Establishment or conduct of outdoor eating facility without a permit	350
5.14	Failure of permit holder to remove outdoor eating facility when requested	200
6.6	Failure to comply with a condition of a permit	200
6.10	Failure to produce permit on request of authorised person	125
9.1	Failure to comply with notice given under local law	200

Dated: 16 May 2011.

The Common Seal of the Town of Bassendean was affixed by authority of a resolution of the Council in the presence of—

Cr J. R. H. GANGELL, Mayor.
Mr R. C. JARVIS, Chief Executive Officer.

The Ratepayers of
Chesterton Rd properties
BASSENDEAN 6054
28 January 2017

TO: Ken Cordy
Manager Asset Services
Town of Bassendean

Dear Ken,

Thanks for meeting with us recently to outline the council policy on verge treatments. As discussed, we wish the council to reconsider its position on acceptable verge treatments, and particularly with respect to the use of gravel, paving and artificial grass type materials.

As advised, the council policy is derived from the Activities On Thoroughfares And Trading In Thoroughfares And Public Places Local Law 2010. The relevant sections are:

2.1 General Prohibitions,

(i) obstructs the thoroughfare or verge; or

(ii) results in a hazard for any person using the thoroughfare or verge;

As the use of gravel, paving or artificial grass neither obstructs or presents a hazard, its use is not prohibited by this section.

2.7 Permissible Verge Treatments,

(c) the installation of an acceptable material

And

2.6 Interpretation

"acceptable material" means any material which will create a hard surface, and which appears on a list of acceptable materials maintained by the local government.

The council has chosen not comply with Section 2.6 as there is no acceptable materials list relevant to Section 2.7(c). We accept that there is the use of Permeable/Porous pavers but this is only in respect of Section 2.7(d) and a single item is not a list. It is clearly the point of the legislation that there should be a list of materials, such as gravel, paving or artificial grass, which will create a hard surface and be acceptable for verge use.

On this basis, we ask the council to reconsider its policy to be more compliant with the relevant legislation.

We also wish to address some of the other issues that were discussed at the meeting.

1. Improvements to the verge are optional. We would contend that the state of the verge at the completion of developing a house would be sand and weed/dead grass. This is how many of the verges in our area are maintained, so all "improvements" have to be considered with respect to this state.

2. Grass. Prior to the use of the gravels, paving or artificial grass, we attempted to maintain a grass verge. Due to the soil, climatic conditions, watering rosters and budgetary/time constraints, we were unable to keep the grass alive and our verges reverted to the natural "sand and weed/dead grass" state.

3. Mulch. Apart from the unpleasant aspect of the appearance of old mulch, it is considered unhygienic and somewhat of a fire risk. It is also possibly contrary to Section 2.1(c) in that it may obstruct thoroughfare.

4. Low growing plant cover. Clearly this is contrary to Section 2.1(c) where there is no footpath. Also would require investment of water, time and money.

5. Water conservation. As previously stated, despite the use of sprinklers and millions of litres of water, we were unable to maintain grass. The gravel, paving or artificial turf does not require watering and as such, is a better waterwise option.

6. Water runoff. We have noticed a better absorption of water with gravel or artificial turf compared to natural sand and weed surface. The effect is similar to that of mulch or porous pavers.

7. Drainage issues. All gravel is maintained within borders. There are minimal amounts of material that leave the verge.

8. Heat island. Gravel, paving or artificial grass generates no more heat than "sand and weed/dead grass". The "heat island" argument is not applicable.

9. Parking. The gravel or paved areas have the added benefit in that it is suitable for overflow parking. Street parking in this area has resulted in accidents and is hazardous, particularly near intersections.

10. Artificial Grass. Artificial grass is generally laid over a bed of fine gravel and as such maintains many of the benefits of gravel, with the added benefits of no base material being able to be spread into drains and has an attractive architectural appearance.

11. Paving. Similar to council footpaths but with better water absorption due to small format.

12. Local issues. We often feel that the policies of the council are made to reflect the older riverside sections of the area. Our street is much more urbanized and as such, we feel the policies of the council are not relevant to our area.

A quick survey of the 64 properties in Chesterton/Filkins without a footpath showed that only 33 (27grass, 4 mixed, 1 shrub, 1 mulch) were compliant with council policy. The remaining 31 were either sand and weed/dead grass (21), gravel (7), or paved (3).

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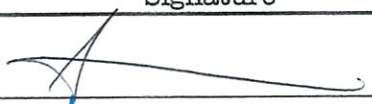
Carl Brown	24	carl@roadkill.net.au	
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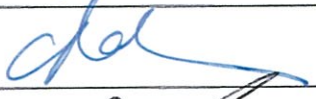
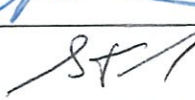
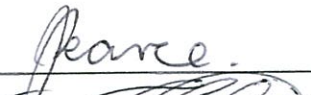
Troy Snelling	13	tasman@arach.net.au	
VAN VAN HONG	18	—	
CARRIE ROBINSON	11	75MURPHYM75@GMAIL.COM	
SHANE TYLER	23	SHANE.TYLER@BIGPOND.COM	
JM Pearce	19	jillmp@ozemail.com.au	
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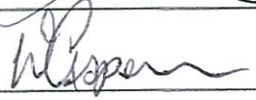
DOUG ASPEN	17	THE_ASPENS@BIGPOND.COM	
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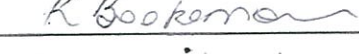
KERRY BOEKEMAN	96.	BROADWAY absolutely Keen 61 @ bigpond.com.au	
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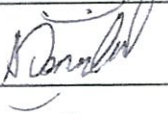
Sindy Demidenko	4A	" "	
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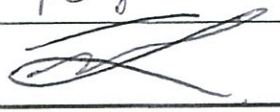
NICK RENZULLO	3	nrenzullo@hotmail.com	

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Justin Benson-Cooper	66	CHESTERTON RD, BASSENDEAN	
Pina Paterniti	1	Filkins st Bassendean	
MARIO PATERNITI	1	Filkins St Bassendean	
GAVIN KERR	19	CHESTERTON RD BASSO	


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TOWN OF BASSENDEAN
Home by the Swan

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Our Ref

Colin Dennis
115B Anzac Terrace
Bassendean WA 6054

Dear Colin

Re: Non-compliant verge treatment – 115B Anzac Terrace, BASSENDEAN

As you were previously informed via email on 22nd November 2016 that the verge treatment at the above mentioned address does not comply with the Town of Bassendean requirements/policy and a copy of the Council's Permissible Verge Treatment was endorsed for your information.

The above mentioned policy states that "*no more than one third of the verge shall be paved excluding the crossover*". The recently conducted inspections revealed that the entire verge adjacent to 115B Anzac Terrace has been paved.

Please note that before carrying out any works in the road reserve an application needs to be submitted; please find the Verge Treatment Application Form on the last two pages of the Verge Treatment Policy endorsed for your information.

You are hereby given notice that the verge treatment applied to the verge adjacent to 115B Anzac Terrace has not been done in accordance to the Town of Bassendean Permissible Verge Treatment policy.

Please contact the undersigned to discuss a time frame for the removal of the non-compliant verge treatment and to obtain any further information.

Should you wish to discuss any aspect of this matter further, please telephone the undersigned on 9377 9027, during normal officer hours.

Yours faithfully

Andreea Balica

Engineering Technical Assistant / Compliance Officer

07/02/2017