Australian Government
Department of the Environment

Referral of proposed action

What is a referral?

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of NES without approval from the Australian Government Environment Minister or the Minister's delegate. (Further references to 'the Minister' in this form include references to the Minister's delegate.) To obtain approval from the Environment Minister, a proposed action should be referred. The purpose of a referral is to obtain a decision on whether your proposed action will need formal assessment and approval under the EPBC Act.

Your referral will be the principal basis for the Minister's decision as to whether approval is necessary and, if so, the type of assessment that will be undertaken. These decisions are made within 20 business days, provided sufficient information is provided in the referral.

Who can make a referral?

Referrals may be made by or on behalf of a person proposing to take an action, the Commonwealth or a Commonwealth agency, a state or territory government, or agency, provided that the relevant government or agency has administrative responsibilities relating to the action.

When do I need to make a referral?

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A)
- National Heritage places (sections 15B and 15C)
- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A)
- Protection of the environment from nuclear actions (sections 21 and 22A)
- Commonwealth marine environment (sections 23 and 24A)
- Great Barrier Reef Marine Park (sections 24B and 24C)
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
- The environment, if the action involves Commonwealth land (sections 26 and 27A), including:
    - actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land);
    - actions taken on Commonwealth land that may have a significant impact on the environment generally;
- The environment, if the action is taken by the Commonwealth (section 28)
- Commonwealth Heritage places outside the Australian jurisdiction (sections 27B and 27C)

You may still make a referral if you believe your action is not going to have a significant impact, or if you are unsure. This will provide a greater level of certainty that Commonwealth assessment requirements have been met.

To help you decide whether or not your proposed action requires approval (and therefore, if you should make a referral), the following guidance is available from the Department's website:

- the Policy Statement titled Significant Impact Guidelines 1.1 – Matters of National Environmental Significance. Additional sectoral guidelines are also available.

- the Policy Statement titled Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies.
- the Policy Statement titled Significant Impact Guidelines: Coal seam gas and large coal mining developments—Impacts on water resources.
- the interactive map tool (enter a location to obtain a report on what matters of NES may occur in that location).

Can I refer part of a larger action?

In certain circumstances, **the Minister may not accept a referral for an action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act).** If you wish to make a referral for a staged or component referral, read 'Fact Sheet 6 Staged Developments/Split Referrals' and contact the Referrals Gateway (1800 803 772).

Do I need a permit?

Some activities may also require a permit under other sections of the EPBC Act or another law of the Commonwealth. Information is available on the Department's web site.

Is your action in the Great Barrier Reef Marine Park?

If your action is in the Great Barrier Reef Marine Park it may require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If a permission is required, referral of the action under the EPBC Act is deemed to be an application under the GBRMP Act (see section 37AB, GBRMP Act). This referral will be forwarded to the Great Barrier Reef Marine Park Authority (the Authority) for the Authority to commence its permit processes as required under the Great Barrier Reef Marine Park Regulations 1983. If a permission is not required under the GBRMP Act, no approval under the EPBC Act is required (see section 43, EPBC Act). The Authority can provide advice on relevant permission requirements applying to activities in the Marine Park.

The Authority is responsible for assessing applications for permissions under the GBRMP Act, GBRMP Regulations and Zoning Plan. Where assessment and approval is also required under the EPBC Act, a single integrated assessment for the purposes of both Acts will apply in most cases. Further information on environmental approval requirements applying to actions in the Great Barrier Reef Marine Park is available from http://www.gbrmpa.gov.au/ or by contacting GBRMPA's Environmental Assessment and Management Section on (07) 4750 0700.

The Authority may require a permit application assessment fee to be paid in relation to the assessment of applications for permissions required under the GBRMP Act, even if the permission is made as a referral under the EPBC Act. Further information on this is available from the Authority:

Great Barrier Reef Marine Park Authority

2-68 Flinders Street PO Box 1379
Townsville QLD 4810
AUSTRALIA

Phone: + 61 7 4750 0700
Fax: + 61 7 4772 6093

www.gbrmpa.gov.au

What information do I need to provide?

Completing all parts of this form will ensure that you submit the required information and will also assist the Department to process your referral efficiently. If a section of the referral document is not applicable to your proposal enter N/A.

You can complete your referral by entering your information into this Word file.

Instructions

Instructions are provided in blue text throughout the form.

Attachments/supporting information

The referral form should contain sufficient information to provide an adequate basis for a decision on the likely impacts of the proposed action. You should also provide supporting documentation, such as environmental reports or surveys, as attachments.

Coloured maps, figures or photographs to help explain the project and its location should also be submitted with your referral. Aerial photographs, in particular, can provide a useful perspective and context. Figures should be good quality as they may be scanned and viewed electronically as black and white documents. Maps should be of a scale that clearly shows the location of the proposed action and any environmental aspects of interest.

Please ensure any attachments are below three megabytes (3mb) as they will be published on the Department's website for public comment. To minimise file size, enclose maps and figures as separate files if necessary. If unsure, contact the Referrals Gateway (email address below) for advice. Attachments larger than three megabytes (3mb) may delay processing of your referral.

Note: the Minister may decide not to publish information that the Minister is satisfied is commercial-in-confidence.

How do I pay for my referral?

From 1 October 2014 the Australian Government commenced cost recovery arrangements for environmental assessments and some strategic assessments under the EPBC Act. If an action is referred on or after 1 October 2014, then cost recovery will apply to both the referral and any assessment activities undertaken. Further information regarding cost recovery can be found on the Department's website.

Payment of the referral fee can be made using one of the following methods:

- **EFT Payments can be made to:**

  BSB: 092-009
  Bank Account No. 115859
  Amount: $7352
  Account Name: Department of the Environment.
  Bank: Reserve Bank of Australia
  Bank Address: 20-22 London Circuit Canberra ACT 2601
  Description: The reference number provided (see note below)

- **Cheque** - Payable to "Department of the Environment". Include the reference number provided (see note below), and if posted, address:

  The Referrals Gateway
  Environment Assessment Branch
  Department of the Environment
  GPO Box 787
  Canberra ACT 2601

- **Credit Card**

  Please contact the Collector of Public Money (CPM) directly (call (02) 6274 2930 or 6274 20260 and provide the reference number (see note below).

Note: in order to receive a reference number, submit your referral and the Referrals Gateway will email you the reference number.

How do I submit a referral?

Referrals may be submitted by mail or email.

Mail to:

Referrals Gateway
Environment Assessment Branch
Department of Environment
GPO Box 787
CANBERRA ACT 2601

- If submitting via mail, electronic copies of documentation (on CD/DVD or by email) are required.

Email to: epbc.referrals@environment.gov.au

- Clearly mark the email as a 'Referral under the EPBC Act'.
- Attach the referral as a Microsoft Word file and, if possible, a PDF file.
- **Follow up with a mailed hardcopy including copies of any attachments or supporting reports.**

What happens next?

Following receipt of a valid referral (containing all required information) you will be advised of the next steps in the process, and the referral and attachments will be published on the Department's web site for public comment.

The Department will write to you within 20 business days to advise you of the outcome of your referral and whether or not formal assessment and approval under the EPBC Act is required. There are a number of possible decisions regarding your referral:

The proposed action is NOT LIKELY to have a significant impact and does NOT NEED approval

No further consideration is required under the environmental assessment provisions of the EPBC Act and the action can proceed (subject to any other Commonwealth, state or local government requirements).

The proposed action is NOT LIKELY to have a significant impact IF undertaken in a particular manner

The action can proceed if undertaken in a particular manner (subject to any other Commonwealth, state or local government requirements). The particular manner in which you must carry out the action will be identified as part of the final decision. You must report your compliance with the particular manner to the Department.

The proposed action is LIKELY to have a significant impact and does NEED approval

If the action is likely to have a significant impact a decision will be made that it is a *controlled action*. The particular matters upon which the action may have a significant impact (such as World Heritage values or threatened species) are known as the *controlling provisions*.

The controlled action is subject to a public assessment process before a final decision can be made about whether to approve it. The assessment approach will usually be decided at the same time as the controlled action decision. (Further information about the levels of assessment and basis for deciding the approach are available on the Department's web site.)

The proposed action would have UNACCEPTABLE impacts and CANNOT proceed

The Minister may decide, on the basis of the information in the referral, that a referred action would have clearly unacceptable impacts on a protected matter and cannot proceed.

Compliance audits

If a decision is made to approve a project, the Department may audit it at any time to ensure that it is completed in accordance with the approval decision or the information provided in the referral. If the project changes, such that the likelihood of significant impacts could vary, you should write to the Department to advise of the changes. If your project is in the Great Barrier Reef Marine Park and a decision is made to approve it, the Authority may also audit it. (See "*Is your action in the Great Barrier Reef Marine Park,"* p.2, for more details).

For more information

- call the Department of the Environment Community Information Unit on 1800 803 772 or
- visit the web site http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999

All the information you need to make a referral, including documents referenced in this form, can be accessed from the above web site.

Referral of proposed action

Project title:

Application of mosquito larvicides to Vasse Wonnerup Wetlands.

1 Summary of proposed action

NOTE: You must also attach a map/plan(s) and associated geographic information system (GIS) vector (shapefile) dataset showing the location and approximate boundaries of the area in which the project is to occur. Maps in A4 size are preferred. You must also attach a map(s)/plan(s) showing the location and boundaries of the project area in respect to any features identified in 3.1 & 3.2, as well as the extent of any freehold, leasehold or other tenure identified in 3.3(i).

1.1 **Short description**

To minimise the incidence of Ross River Virus and Barmah Forest Virus amongst residents and visitors to the City of Busselton, the City proposes to carry out aerial larviciding of mosquito breeding areas in and adjacent to the Vasse Wonnerup Wetlands (Ramsar convention listed wetlands). Application of larvicide will be restricted to identified and suspected mosquito breeding sites which constitute approximately 15% of the wetland area (subject to seasonal variation).

Mosquito treatments in the Vasse Wonnerup Wetlands occur on an as needed basis, in response to meteorologically driven breeding cycles. During the ten years that the City has undertaken aerial treatments in the Vasse Wonnerup Wetlands, there has been an average of 3 aerial treatments per mosquito season, and there has never been a need for more than five aerial applications of larvicide in one season.

It is proposed that only larvicides that have been endorsed by the Department of Health (WA) and approved for use by the Australian Pesticides and Veterinary Medicines Authority (APVMA), will be used by the City. Currently this includes formulations of S-Methoprene and Bacillus Thuringienses var isaelensis (Bti).

1.2 **Latitude and longitude**

Latitude and longitude details are used to accurately map the boundary of the proposed action. If these coordinates are inaccurate or insufficient it may delay the processing of your referral.

	Latitude			Longitude		
location point	degrees	minutes	seconds	degrees	minutes	seconds
SW Corner	33	39	19 (S)	115	21	30 (E)
NE Corner	33	34	49 (S)	115	27	56 (E)

For a full list of coordinates see Appendix 36
For Ramsar site see Map 1
GIS compliant files attached with submission.

1.3 **Locality and property description**

The Vasse Wonnerup wetland system is within the municipal boundaries of the City of Busselton in the state of Western Australia. It is immediately east of the town of Busselton.

See map 1 – Ramsar area with bounding coordinates.

1.4 **Size of the development footprint or work area (hectares)**

1115 Ha

1.5	**Street address of the site**	Layman Road, Busselton

1.6 **Lot description**

1.7 **Local Government Area and Council contact (if known)**

City of Busselton

Contact Officer – Peter Horgan, Environmental Health Officer

City of Busselton
Locked Bag 1
Busselton WA 6280

Phone – (08) 9781 0334
Email – peter.horgan@busselton.wa.gov.au

1.8 **Time frame**

The City is seeking ongoing approval to treat the Vasse Wonnerup Wetlands over mosquito breeding seasons which occur annually between July and January. Mosquito breeding seasons vary in times and duration depending on meteorological conditions.

1.9	**Alternatives to proposed action** Were any feasible alternatives to taking the proposed action (including not taking the action) considered but are not proposed?		Yes Adulticiding (fogging)
			Yes, you must also complete section 2.2
1.10	**Alternative time frames etc** Does the proposed action include alternative time frames, locations or activities?		No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant).
1.11	**State assessment** Is the action subject to a state or territory environmental impact assessment?		In 2005 and 2011 the Environmental Protection Authority of Western Australia were consulted regarding this proposed action. The action was not subject to a state environmental impact assessment.
1.12	**Component of larger action** Is the proposed action a component of a larger action?		
			Yes, you must also complete Section 2.7
1.13	**Related actions/proposals** Is the proposed action related to other actions or proposals in the region (if known)?		Yes
			Yes, provide details: The City's mosquito control program is undertaken in conjunction with larger mosquito control operations that occur in the South West of WA from the Peel Harvey regions within the City of Mandurah, through to Leschenault and Geographe regions including areas in Capel, Harvey and Bunbury. It should be noted that the same mosquito control operations are undertaken throughout multiple Ramsar listed wetlands in Western Australia where they have not been deemed as controlled actions under the EPBC Act.

1.14	**Australian Government funding** Has the person proposing to take the action received any Australian Government grant funding to undertake this project?		Yes, provide details: The larviciding program is joint funded by the State department of health, who provide the helicopter and 50% of larvicide costs.
1.15	**Great Barrier Reef Marine Park** Is the proposed action inside the Great Barrier Reef Marine Park?		No

2 Detailed description of proposed action

NOTE: It is important that the description is complete and includes all components and activities associated with the action. If certain related components are not intended to be included within the scope of the referral, this should be clearly explained in section 2.7.

2.1 Description of proposed action

This should be a detailed description outlining all activities and aspects of the proposed action and should reference figures and/or attachments, as appropriate.

Ross River virus (RRV) occurs in nature in transmission cycles between mosquitoes and native fauna. It causes epidemic polyarthritis and chronic fatigue in humans when transmission cycles flow over into human populations. Saltmarsh wetlands in the Vasse Wonnerup System are known to breed prolific numbers of the RRV vector mosquitoes, *Aedes camptorhynchus* and to a lesser extent, *Oc. Vigilax.* Long term surveillance of mosquitoes and arboviruses carried out by The University of Western Australia (under contract to Department of Health WA) has shown that these wetlands are foci of RRV activity in spring and summer months, with most isolates of RRV being obtained from saltmarsh mosquito species. (Appendix 1 – DOH letter)

During an epidemic of RRV that occurred in 1988/89 over 800 people in the South West region of WA were diagnosed as suffering from RRV disease. In the City of Busselton, during the 2003/04 mosquito season, there were 221 confirmed cases of RRV Disease (See appendix 2 – Ross River Virus Disease Notifications). To meet the risks posed by mosquito borne diseases, the City has developed and implemented a mosquito management strategy which consists of the following five parts:

- Pre-treatment larval surveys
- Larviciding (aerial and hand treatments)
- Post treatment larval monitoring
- Adult mosquito trapping, identification and counting
- Public education

Pre-treatment Surveys:

A survey of the Vasse Wonnerup Wetlands carried out during the winter and spring of 1996 by consulting Medical Entomologist Mr A.E Wright (see Appendix 3) and subsequent surveys undertaken by Rankine Mosquito Management in 2010 (appendix 4), and consulting Medical Entomologist Mike Muller in 2014, have identified five main mosquito breeding sites in the Vasse Wonnerup System.

Site 1: An area of samphire wetland near Ford Road, approximately 75 hectare in area

Site 2: The samphire wetland in the vicinity of Port Geographe, approximately 110 hectares in area

Site 3: The north eastern periphery of Wonnerup Inlet approximately 60 hectares in area

Site 4: A patch of samphire wetland on the southern side of the inlet near Barracks Drive Reinscourt, approximately 20 hectares in area

Site 5: A strip of samphire wetland on the southern side of the inlet near Estuary Waters Drive Reinscourt, approximately 25 hectares in area.

Salt marsh mosquito breeding within these five sites occurs in cohorts which are driven by rainfall events. City Environmental Health Officers closely monitor rainfall during the mosquito season, and undertake regular larval monitoring in selected locations within known mosquito breeding sites. Monitoring involves taking a water sample with a larval dipper to gather information on the number of mosquito larvae present per m2. The collation of sampling results determines if there is a need for

aerial application of larvicide, or if smaller targeted hand treatments will suffice. At the time of the survey, water temperatures are measured so that estimations can be made on the suspected speed of larval development, and observations are recorded regarding any large congregations of waterbirds.

Aerial Larvicide Application

Where larval breeding is extensive in peripheral wetlands, and aerial application is deemed necessary, the City of Busselton liaises with the local office of the Department of Parks and Wildlife (DPAW) for information on nesting / breeding waterbirds. Any active waterbird breeding areas identified by DPAW or Local Government Officers are flagged as no-fly zones. Flight maps are developed by Environmental Health Officers using QGIS, and areas requiring treatment are identified using polygon layers. Flight maps are then presented to contractor responsible for providing the helicopter for aerial treatments. These maps are loaded into the helicopter computers, and ensure that only sites which are identified by City Officers as requiring treatment, are treated with larvicide. The flight maps also ensure bird breeding habitat is not disrupted by helicopter activity. Treatments are applied to fringing samphire areas and identified mosquito breeding sites which constitute approximately 15% of the wetland area (subject to seasonal variations). Map 4 shows the areas treated with larvicide during the 2015/16 season.

Since 2005, the City has undertaken aerial application of larvicide to the Vasse Wonnerup Wetlands in strict adherence with conditions stipulated under previous ministerial decisions EPBC 2005/1952, EPBC 2010/5490, and EPBC 2010/5593 (see appendix 5 – EPBC approvals). The larvicide used for the majority of these treatments has been a sand formulation of S-Methoprene, however, more recently the City has also been using granular formulations of Bacillus thuringiensis var israelensis (Bti). Both of these larvicides are approved by the APVMA for the purpose of controlling salt marsh mosquitoes (see appendix 6 – APVMA approval), both have proven highly effective at controlling mosquito larvae in the Vasse Wonnerup System (Paice 2016), both are applied at very low application rates (Appendix 7 & 8 – Product Labels), both are species specific to mosquitoes, and both have no non-target impacts (see section 3).

The selection of larvicide is largely determined by the spectrum of larval instars discovered during monitoring. When distinct cohorts of larvae are present, Bti is generally selected because it is cheaper than prosand, highly effective, and has a shorter residual activity in the wetlands. When distinct cohorts are less apparent, and larvae are spread between 1^{st} – 4^{th} instars S-Methoprene is generally used because of its longer residual activity. Weather conditions also influence the choice in larvicide product. When larvicide application is required 1-3 days before a forecasted cold front, Bti will generally be preferred due to its faster efficacy.

The City proposes to continue using different formulations of the larvicides Bti and S-Methoprene over the Vasse Wonnerup Wetlands. Furthermore, the City may incorporate new larvicide products for the purpose of mosquito control once;

- they have been approved for use by the APVMA, and
- they are demonstrated to have no non-target impacts, and
- they are deemed environmentally acceptable, and
- they are approved for use by the Department of Health, West Australia.

Hand Larvicide Application

When larval monitoring identifies small (<1 ha), areas of localised high density larval activity, in close proximity to residential areas, the City proposes to undertake small scale hand treatments with Bti

and S-Methoprene based larvicides. This will be undertaken by a City Officer with a back pack spray applicator, and will only involve treatment of small isolated pools peripheral to the larger wetland.

Post Treatment Survey

Post treatment larval surveys and sampling are undertaken after each aerial application of larvicide, to ensure the ongoing efficacy of treatments.

Bti treatments are fatal for mosquito larvae, and the effectiveness of a treatment is determined by comparing pre-treatment larval numbers with post treatment larval numbers ascertained through larval dipping.

S-Methoprene is a growth hormone inhibitor, and treatments are not directly fatal to mosquito larvae. The effectiveness of S-Methoprene treatments are determined by taking larval samples and monitoring development and emergence over the course of ten days. A successful treatment will be marked by larvae not developing into adult mosquitoes.

Results of all post treatment sampling are sent to the mosquito control branch at the Department of Health (WA).

Trapping of Adult Mosquitoes

The City places carbon dioxide baited mosquito traps in strategic locations around wetlands and residential areas. Traps are used to monitor the number, species, and movement, of adult mosquitoes to help guide the mosquito control program. The University of Western Australia also undertakes mosquito trapping within the City of Busselton, which they use to monitor the presence of Ross River Virus isolates in adult mosquitoes.

Adult trapping allows the City to measure the effectiveness of mosquito control operations, and allows the Department of Health to monitor Virus presence.

Public Education and Media Releases

In 2016 the City of Busselton is launching a new 'Fight the Bite' mosquito awareness campaign to raise community awareness of the presence of Ross River and Barmah Forrest Virus. The campaign includes public presentations, television advertising and radio interviews. If, during the mosquito season, Ross River Virus isolates are detected in mosquito traps, the Department of Health (WA) issues media releases which are published in local papers within the City of Busselton.

2.2 Alternatives to taking the proposed action

This should be a detailed description outlining any feasible alternatives to taking the proposed action (including not taking the action) that were considered but are not proposed (note, this is distinct from any proposed alternatives relating to location, time frames, or activities – see section 2.3).

Adulticiding

If the City were not to undertake aerial application of larvicide, the need for thermal fogging with adulticides would dramatically increase due to the number of adult mosquitoes that would emerge from the untreated wetlands.

Aqua K Othrine is the least toxic chemical currently available for adulticiding. Aqua K Othrine contains 20g/L of deltamethrin, a non-specific synthetic pyrethroid, and 250g/L of petroleum solvent naptha, a heavy aromatic. It is applied via fogging at a rate of 50mL/ha. Aqua K Othrine is very toxic to fish (LC50 0.0539 mg/L exposure time 96 hours) and aquatic invertebrates (EC50 0.00056mg/L exposure

time 48 hours), and may cause long term adverse effects in the aquatic environment. (See appendix 11 – Aqua K Othrine Label and MSDS)

Historically (since the early 1990's), the City has undertaken adulticiding via fogging with synthetic pyrethroids Aqua K Othrine and Reslin. However, since 2005 the effectiveness of aerial application of larvicides has significantly reduced the need for fogging. So while fogging operations used to occur almost daily during the mosquito season, aerial application of larvicide to the Vasse Wonnerup wetlands has reduced the need for fogging to such an extent that the City has only fogged on one evening in the last four years.

It should be noted that the unencumbered continuation of aerial larviciding will continue to reduce the number of disease carrying mosquitoes emerging from wetlands, which in turn, will continue to negate the need for regular fogging operations. The environmental benefits of using the proposed eco-friendly and species specific larvicides, to prevent the need for fogging, should not be underestimated.

2.3 Alternative locations, time frames or activities that form part of the referred action

NA

2.4 Context, planning framework and state/local government requirements

Explain the context in which the action is proposed, including any relevant planning framework at the state and/or local government level (e.g. within scope of a management plan, planning initiative or policy framework). Describe any Commonwealth or state legislation or policies under which approvals are required or will be considered against.

Mosquito Control and Minimisation Strategy

Mosquitoes are known to present serious health risks to visitors and residents within the City of Busselton. To address these problems the City developed a 'Mosquito Control and Minimisation Strategy' (see appendix - 12). Council endorsed the Strategy as the basis for the development of future Mosquito Control programs and to provide direction for Councils future efforts in addressing the mosquito problem. The strategy identifies planning mechanisms for the protection, maintenance and enhancement of the wetlands and clearly identifies the mosquito problem, determination of practical objectives of mosquito control operations, and the establishment of a process for evaluating the control program. The strategy was developed to provide a responsible balance that is acceptable to the community, is not detrimental to the environment, and strives to improve Public Health and sustain quality of life. The objectives of the Mosquito Strategy include (but are not limited to):

- reduce residents exposure to disease carrying mosquitoes;
- minimize the use of chemicals for the control of mosquitoes; and
- control mosquitoes using the most cost effective and environmentally safe methods available

City of Busselton Environment Policy

The 'City of Busselton Environment Policy' (see appendix 13) requires that decisions and activities of the Council will have regard to relevant environmental legislation and be based upon recognised best practise environmental management strategies. The mosquito control and minimisation strategy has been prepared with this view firmly in mind and the implementation of the strategy will abide by these principals.

Busselton Wetlands and Conservation Strategy (Oct 2005).

The Western Australian Planning Commission developed the Busselton Wetlands and Conservation Strategy in collaboration with the Department of Conservation and Land Management, the Department of Environment Regulation, the Department of Agriculture, the Water Corporation, the City of Busselton and Geocatch. The strategy states that a long term mosquito management program to minimise the incidence of RRV and Barmah Forest Virus exposure should be considered in

conjunction with the City of Busselton (Busselton Wetlands Conservation Strategy available at http://www.planning.wa.gov.au/dop_pub_pdf/Buss_Wetlands_report.pdf).

Memorandum of Understanding Geographe Contiguous Local Authorities Group (2014)
A Contiguous Local Authority Group (CLAG) consists of several local government authorities that pool resources to deal with a shared mosquito problem. A regional approach and coordinated control effort by Local Authorities results in a far greater efficiency and cost effectiveness in control efforts, with a consequent reduction in dependence on the State. The City of Busselton has formed a CLAG with the adjacent Shire of Capel, the objectives of the combined agreement are to minimise mosquito borne disease and nuisance mosquitoes within the local government areas and to arrange for the allocation, management and administration of funds for the strategy.

2.5 Environmental impact assessments under Commonwealth, state or territory legislation

The City has previously referred the mosquito control program to the Environmental Protection Authority in 2005. The City was advised that an Environmental Impact Assessment under state legislation was not necessary due to the program having been referred to, and assessed by the (then) Department of Environment and Heritage under the Environmental Protection Biodiversity Conservation Act 1999.

2.6 Public consultation (including with Indigenous stakeholders)

Your referral must include a description of any public consultation that has been, or is being, undertaken. Where Indigenous stakeholders are likely to be affected by your proposed action, your referral should describe any consultations undertaken with Indigenous stakeholders. Identify the relevant stakeholders and the status of consultations at the time of the referral. Where appropriate include copies of documents recording the outcomes of any consultations.

Prior to the commencement of larviciding activities in 2005, the City advertised and held several community information sessions on the proposed aerial application of larvicide to the Vasse Wonnerup Wetlands. The information sessions included presentations from Dr Mike Lindsay (Department of Health WA) and were delivered at City of Busselton and Shire of Capel offices.

As a part of EPBC2010/5490 in accordance with Section 95A of the Environmental Protection Biodiversity Conservation Act 1999 the City of Busselton gave notice of the proposed action in the West Australian Newspaper on 20th May 2011, and The Busselton Dunsborough Mail on 22 June 2011. All details on the proposed action were made publicly available at the City Office, the State Library, and the Busselton Library.

During the EPBC2010/5490 referral process the registered native title holders for the Vasse Wonnerup area were consulted regarding this action, and on Wednesday 23rd June 2010, City Environmental Health Officer Peter Horgan delivered a presentation on aerial application of larvicide in the Vasse Wonnerup Wetlands to the South West Aboriginal Land and Sea Council.

The Sabina and Abba Rivers are listed as important mythological Aboriginal heritage sites associated with the Waugal and are protected by the Western Australian Aboriginal Heritage Act, however, these sites do not form a part of the treatment area.

In a 2011 Community Survey undertaken by the City of Busselton (in which 1269 respondents participated), 89% of participants rated mosquito control as very important. 79% of respondents stated that they were either extremely, very, or moderately satisfied with the Citys mosquito control operations. Similarly, in a 2005 community survey respondents identified mosquito control as the third most important service provided by the City of Busselton (more important than the provision of sporting facilities, libraries, and the provision of dog control). There is a strong public awareness of the City's mosquito control operations, and a strong community expectation that the City will

continue to undertake mosquito control operations. Furthermore, a significant percentage of the population would like to see the City do more in this regard.

2.7 A staged development or component of a larger project

If you have identified that the proposed action is a component of a larger action (in section 1.12) you must complete this section. Provide information about the larger action and details of any interdependency between the stages/components and the larger action. You may also provide justification as to why you believe it is reasonable for the referred action to be considered separately from the larger proposal (eg. the referred action is 'stand-alone' and viable in its own right, there are separate responsibilities for component actions or approvals have been split in a similar way at the state or local government levels).

The Department of Health (WA) provides state funding for a number of CLAG's to undertake aerial application of S-Methoprene and Bti based larvicide products to wetland areas around Western Australia, this includes the following areas in the South West: Peel Harvey, Leschenault, and Geographe. Aerial application of the same approved larvicide products are regularly applied to large areas of the Ramsar listed Peel-Yalgorup wetlands where their application has not been considered a controlled action.

Treatment of the Vasse Wonnerup Wetlands are often undertaken concurrently with treatment of adjacent wetlands in the Shire of Capel. In 2006, due to the proximity of these adjacent wetlands to the Ramsar site, the Shire of Capel referred their own mosquito control program to the (then) Department Sustainability Environment Water Population and Communities under the Environmental Protection Biodiversity Conservation Act 1999. The referral from the Shire of Capel was deemed not to be a controlled action on 14th March 2006.

Proposed action to be considered separately from larger project

Given that mosquito control operations in adjacent wetlands at the Shire of Capel have been the subject of a separate referral, and given the distances between the Vasse Wonnerup Wetlands and the Leschenault and Peel Harvey regions, this proposed action should be considered separately from larger mosquito control operations throughout the South West of Western Australia.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest.

Your assessment of likely impacts should refer to the following resources (available from the Department's web site):

- specific values of individual World Heritage properties and National Heritage places and the ecological character of Ramsar wetlands;
- profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;
- *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*; and
- associated sectoral and species policy statements available on the web site, as relevant.

3.1 (a) World Heritage Properties

Description

NA

Nature and extent of likely impact

Address any impacts on the World Heritage values of any World Heritage property.

3.1 (b) National Heritage Places

Description

NA

Nature and extent of likely impact

Address any impacts on the National Heritage values of any National Heritage place.

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

Vasse Wonnerup Ramsar Wetlands

The Vasse Wonnerup System is an extensive, shallow and nutrient enriched waterbody approximately 7km long (west to east) and up to 600m wide. Almost all the wetland area has a maximum depth of less than 1 metre and dries out in late summer. The Vasse Wonnerup System is listed as an Internationally Important Wetland under the Ramsar Convention because of its significance for waterbirds. Criteria under which the system is listed are that it regularly supports more than 20,000 waterbirds, and that it regularly supports more than 1% of the population of the black winged stilt *Himanotpus himantopus* and the Red-necked Avocet *Recurvirostra novaehollandiae* (DEWHA, 2009) See appendix 14 – Information Sheet on Vasse Wonnerup Wetlands.

Both the Vasse and Wonnerup lagoons are highly modified. They were formerly estuaries, however floodgates (weirs) were installed at the mouths of each estuary more than a century ago. The Estuaries now act as compensating basins for water discharging from the Vasse, Abba, Ludlow and Sabina Rivers.

Until 2004 when new floodgates were installed on the system, water in the Vasse Wonnerup System was generally fresh in winter and became saline and then hypersaline in summer, due to leakage past the old wooden floodgates, and since 1988 some seawater has been allowed to enter during the summer months to assist to reduce the incidence of mass fish deaths in the lower reaches of the system, particularly the Vasse Estuary (See appendix 15 - Lane et al., 2007). Leakage of seawater was substantially reduced by the installation of the new floodgates, however management of the floodgates since their installation has allowed for seawater to be periodically added to the system to meet both environmental and social objectives.

Nature and extent of likely impact

Waterbird Disturbance from Helicopter

See:
Appendix 16 – Aerial larvicide application in the Vasse Wonnerup Wetlands System: Reducing Impacts on Water Birds, Elscot
Appendix 17 – Monitoring the effect upon waterbirds of spraying larvicide by helicopter on the Vasse Wonnerup estuary, Bamford
Appendix 18 – OTS larvicide treatment of Vasse Wonnerup site, Rutherford

Aerial application of larvicide by helicopter is a short term, temporary disturbance that affects areas favoured by waterbird breeding, foraging, roosting and loafing within the system. The primary concern is displacement of large flocks, or disturbance of nesting waterbirds caused by the presence of the helicopter.

In accordance with the conditions of approval set under EPBC2005/1952, ecological consultants accompanied helicopter flights during the first larviciding treatments of 2007, 2008 and 2009. The ecological consultants observed how birds responded to the presence of the helicopter and reported on potential impacts. The reporting concluded that 'Disturbance to foraging, roosting and loafing birds at the scale and intensity caused by the larvicide program is likely to have minimal impacts', (Elscot 2010). It was suggested that pre-treatment ground surveys to identify large flocks of breeding birds could be used to determine a flight path that will minimise disturbance in these areas. A suitable buffer distance of 100m would be enough to avoid any potential impacts (Elscot 2010). In 2008, Bamford and Doyle also surveyed water birds during a simulated larviciding flight in the helicopter. They noted 'waterbirds appeared to be fairly tolerant of the helicopter approaching slowly at a height of 20-30m, generally beginning to move away at a distance of about 100m (Bamford and Doyle 2009).

Following the reports submitted by Elscot, Bamford and Doyle, and Rutherford, it was concluded that the impact on water birds was minimal, and could be adequately managed through pre treatment ground surveys, the development of appropriate flight maps, and pilot awareness.

The various ecological consultants recommendations are discussed further in Section 5. Measures to Avoid or Reduce Impacts.

Potential Impacts of Larviciding Operations on Food Chain for Migratory Waterbirds

Potential Impacts Due to Reduction on Non Target Macroinvertebrates:

The potential for larvicide applications to impact on non-target macro invertebrates (and therefore the food chain for migratory birds), has previously resulted in the City of Busselton being required to undertake pre and post treatment monitoring of macro invertebrate populations in three treatment, and three control sites, with each application of larvicide in the Vasse Wonnerup Wetlands (see conditions - EPBC2010/5490).

Accordingly, macro invertebrate sampling has been undertaken with each application of larvicide in the Vasse Wonnerup Wetlands since 2009. The results of this sampling have been collated, reviewed and reported upon in (Appendix 19 – Paice 2016).

Aquatic invertebrate sampling in the Vasse Wonnerup Wetlands over seven years has found no evidence of adverse impacts of larvicide use on non-target macroinvertebrates, for either S-methoprene or Bti. The indicator groups Ostracoda and Amphipoda were the most abundant macroinvertebrate taxa, along with Chironomidae. Larvicide treatments had no negative effects on abundance of these groups, nor were there any impacts found for other macroinvertebrate groups, zooplankton or aquatic invertebrate diversity (Paice 2016). Non-target macro invertebrate monitoring undertaken by the City has demonstrated that any indirect impacts on waterbirds through reduced availability of aquatic invertebrates as a food resource is highly unlikely (Appendix 19 - Paice 2016).

The findings from the macroinvertebrate studies commissioned by the City of Busselton are in keeping with the conclusions of recent independent studies undertaken into non target impacts of both larvicides.

Bti

A 2016 study by Lagadic et al entitled '*No association between the use of Bti for mosquito control and the dynamics of non-target aquatic invertebrates in French coastal and continental wetlands'* examined the impacts of Bti in eight sites over four consecutive years. This study was the first field investigation ever conducted at such a large, national geographic scale on the effect of Bti on aquatic invertebrates in coastal and continental wetlands covering a wide range of ecological conditions. It showed that: 'when recommended application rates and best practices for mosquito control are strictly followed, the use of the VectoBac and 12AS formulations of Bti can be considered as safe for non-target aquatic invertebrates, including chironomids' (Appendix 27 - Lagadic et al 2016).

In 2009, Lundstrom et al published a report into the effects of Bti on wetland Chironomidae (Diptera) in flood plain wetlands in Sweden. The study was undertaken in three wetlands, over six years, and concluded that the Bti-based control of flood water mosquitoes does not cause any major direct negative effects on chironomid production, and therefore does not seem to induce any risk for indirect negative effects on birds, bats or any other predators feeding on Chironomids (Appendix 28 - Lundstrom et al 2009).

Similarly, a 2014 study by Marina et al entitled '*Efficacy and non-target impacts of spinosad, Bti and*

temephos larvicides for control of Anopheles spp. In an endemic malaria region of southern mexico', concluded that 'in line with previous studies on the high specificity of Bti-based products, Bti had only minor effects on the numbers of species and genera, compared to the control pools.' (Appendix 29 – Marina et al (2014)

Bti strains used in pest control have a proven history of environmental safety. Bti is highly selective and thus has very little potential to cause damage to populations of non-target organisms. Most of the studies conducted on the effects of Bti on non-target organisms have shown little or no effect (Appendix 30 - Stark 2005).

S-Methoprene

Results of the City's non target macro invertebrate sampling did not indicate any negative impacts from the long term use of S-Methoprene. Statistical testing proved that after nineteen applications of S-methoprene, over seven years, there was no difference between pre-treatment, post-treatment and control samples, at any stage. The availability of long term data for this study, and the high level of non-significance found between sample types, provides a high level of confidence in these findings. (Appendix 19 - Paice 2016)

The findings of the City's macroinvertebrate monitoring program are consistent with other independent studies which have found negligible effects on non-target aquatic invertebrates of S-Methoprene at the application rates required for effective mosquito control (See appendix 31 - Pinkney et al, 2000 and Appendix 32 - Russel et al, 2009).

Butler et al, *'Evaluation of nontarget effects of methoprene applied to catch basins for mosquito control'* 2009, found no evidence of declines in abundances of any taxa attributable to larvicide application, and further, found no consistent changes in community level parameters related to methoprene application in either field or laboratory trials. (Appendix 33 – Butler et al 2009)

The favourable environmental properties of s-methoprene have been established by the work of many different research groups. At the recommended useage rates there is little or no effect on non-target species such as mammals, fish, crustaceans, birds, protozoa, annelids, molluscs, amphibians, damsel flies, mayflies, water beetles, or waterfowl. Methoprene does not bioaccumulate in fish and does not persist in the environment. It undergoes rapid degradation and metabolism in plants, animals, aquatic micro-organisms and soil microbes. Many detailed studies have determined that it has negligible or no effect on non-target aquatic organisms (Appendix 34 - Henrick, 2007)

The Citys reporting, and the findings of the abovementioned independent studies, suggest that any influence of Bti or S-Methoprene on aquatic invertebrates is highly unlikely. Furthermore, these highly unlikely risks are almost completely mitigated on account of the infrequency at which the City of Busselton undertakes larviciding operations, and the small percentage of wetland areas that are treated. Mosquito breeding in the Vasse Wonnerup Wetlands is driven by significant rainfall events in the spring and summer seasons. Since the commencement of the City's aerial larviciding operations in 2006, the City has averaged three aerial applications of larvicide per year. While the need for larvicide application can be highly variable from year to year, it should be noted that EPBC2010/5593 allowed for up to seven aerial applications of larvicide each year, however the City never had cause to use this approval to its full extent. Additionally, the City proposes to use Bti and S-Methoprene on a rotational basis, making it highly unlikely that the Vasse Wonnerup Wetlands would be treated with each larvicide more than twice a year. Furthermore, larvicide spraying is restricted to peripheral areas of the wetlands (approximately 15% of the total Ramsar area), and as these areas dry out, waterbirds move to open water areas which are excluded from larvicide treatment and support high densities of aquatic invertebrates (Chambers et al, 2010).

Potential Impacts Due to a Reduction in Target Macroinvertebrates

The Vasse Wonnerup wetlands have a high abundance and viability of macro invertebrates. In the treatment and control sites monitored by the City of Busselton, macroinvertebrates in the order Amphipoda and Class Ostracode accounted for 60 – 90% of macro invertebrate populations depending on the season and the site sampled (Paice 2010). Mosquito larvae abundance, while highly variable, represents a seasonal and comparatively small percentage of the macro invertebrate population (Paice 2013). The high abundance and viability of non-target macro invertebrates indicates that the impacts on target species themselves, are highly unlikely to effect the food chain for migratory water birds.

3.1 (d) Listed threatened species and ecological communities

Description

Ringtailed possums are known to occur in the 'Tuart National Park' which adjoins the wetland and is partly within the Ramsar Site. Their habitat is primarily dryland vegetation, particularly Agonis Flexuosa. They are not expected to be present in the treatment areas.

Nature and extent of likely impact

None

3.1 (e) Listed migratory species

Description

For a list of migratory species see appendix 14 – Information Sheet on Ramsar Wetlands 2009-2014 version

Nature and extent of likely impact

See section 3.1(c)

3.1 (f) Commonwealth marine area

(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.)

Description

NA

Nature and extent of likely impact

3.1 (g) Commonwealth land

(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land.)

Description

NA

Nature and extent of likely impact

3.1 (h) The Great Barrier Reef Marine Park

Description

NA

Nature and extent of likely impact

3.1 (i) A water resource, in relation to coal seam gas development and large coal mining development

Description

NA

Nature and extent of likely impact

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

You must describe the nature and extent of likely impacts (both direct & indirect) on the whole environment if your project:

- is a nuclear action;
- will be taken by the Commonwealth or a Commonwealth agency;
- will be taken in a Commonwealth marine area;
- will be taken on Commonwealth land; or
- will be taken in the Great Barrier Reef marine Park.

Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

3.2 (a)	**Is the proposed action a nuclear action?**		No
	If yes, nature & extent of likely impact on the whole environment		

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**		No
	If yes, nature & extent of likely impact on the whole environment		

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**		No
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))		

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**		No
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))		

3.2 (e)	**Is the proposed action to be taken in the Great Barrier Reef Marine Park?**		No
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))		

3.3 Other important features of the environment

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed above). If at Section 2.3 you identified any alternative locations, time frames or activities for your proposed action, you must complete each of the details below (where relevant) for each alternative identified.

3.3 (a) Flora and fauna

Birdlife

For a complete list of birds refer to appendix 14 – Information Sheet on Ramsar Wetlands 2009-2014 version

More than 33,000 waterbirds were counted in the Vasse Wonnerup system in January 1986, and data indicates that more than 20,000 waterbirds use the system each year (DEWHA, 2009). In December 1998 surveys recorded a maximum count of 37,500 birds on the wetlands. More than 1% of the population of the Red-necked avocet and the Black Winged Stilt were also recorded confirming that the system still met Ramsar criteria. More recently, more than 1% of the population of Australian Shelduck and Australasian Shoveler have also been identified in the Vasse Wonnerup Wetlands (Appendix 15 - Lane et al, 2007) Another five shorebirds (waders) have been recorded in numbers greater than 1% of the national population: Wood Sandpiper *Tringa glareola*, Sharp tailed Sandpiper *Calidris acuminate*, Long toed Stint *C. subminata*, Curlew Sandpiper *C ferruginea* and Common Greenshand *Tringa nebularia* (DEWHA 2009). The sites migratory shorebirds are listed under the Japan – Australia Migratory Bird Agreement (JAMBA) and the China – Australia Migratory Bird Agreement (CAMBA) and are specially protected by the EPBC Act (1999). Thirteen waterbirds are known to breed within the system, which also supports the largest breeding colony of Black Swans *Cygnus artrutus* in the southwest (DEWHA, 2009)

Fishlife

The Vasse Wonnerup Estuary mainly supports freshwater fish which move within the estuary in response to changes in salinity.

The following fish can be found in the Vasse-Wonnerup Estuary

Common Name	Species Name	Family Family Name
Western Australian Salmon	*Arripis truttaceus*	Arripidae Australasian Salmons
Common Hardyhead	*Atherinomorus vaigiensis*	Atherinidae Silversides
Elongate Hardyhead	*Atherinosoma elongata*	
Spotted Hardyhead	*Craterocephalus mugiloides*	
Silver Fish	*Leptatherina presbyteroides*	
Western Hardyhead	*Leptatherina wallacei*	
Skipjack Trevally*	*Pseudocaranx wrighti*	Carangidae Jacks and Trevally
Sandy Sprat	*Hyperlophus vittatus*	Clupeidae Herrings
Goldfish	*Carassius auratus*	Cyprinidae Carps
Australian Anchovy	*Engraulis australis*	Engraulidae Anchovies
Old Wife	*Enoplosus armatus*	Enoplosidae OldWives
Western Minnow	*Galaxias occidentalis*	Galaxiidae Galaxiids
Common Silverbiddy	*Gerres subfasciatus*	Gerreidae Mojarras
Bridled Goby	*Arenigobius bifrenatus*	Gobiidae Gobies
Southern Longfin Goby	*Favonigobius lateralis*	
Bluespot Goby	*Pseudogobius olorum*	
Southern Garfish*	*Hyporhamphus melanochir*	Hemiramphidae Halfbeaks
Yelloweye Mullet	*Aldrichetta forsteri*	Mugilidae Mullets
Sea Mullet	*Mugil cephalus*	
Western Butterfish*	*Pentapodus vitta*	Nemipteridae Threadfin Breams
Smalltooth Flounder	*Pseudorhombus jenynsii*	Paralichthyidae Sand Flounders
Nightfish*	*Bostockia porosa*	Percichthyidae Temperate Perches
Western Pygmy Perch	*Nannoperca vittata*	
Estuary Cobbler	*Cnidoglanis macrocephalus*	Plotosidae Eeltail Catfish
Eastern Gambusia	*Gambusia holbrooki*	Poeciliidae Livebearers
Tailor	*Pomatomus saltatrix*	Pomatomidae Bluefishes
Mulloway*	*Argyrosomus japonicus*	Sciaenidae Drums
King George Whiting	*Sillaginodes punctata*	Sillaginidae Whitings
Southern School Whiting	*Sillago bassensis*	
Trumpeter Whiting	*Sillago maculata*	
Yellowfin Whiting	*Sillago schomburgkii*	
Western School Whiting	*Sillago vittata*	
Black Bream	*Acanthopagrus butcheri*	Sparidae Porgies
Tarwhine	*Rhabdosargus sarba*	
Yellowtail Grunter	*Amniataba caudavittata*	Terapontidae Grunters
Western Striped Grunter	*Pelates octolineatus*	
Prickly Toadfish	*Contusus brevicaudus*	Tetraodontidae Puffers
Soldier	*Gymnapistes marmoratus*	Tetrarogidae Wasp Fish

(Beatty Et Al, 2014)

Frogs

Species that might occur in or near the Ramsar site are *Crinia insignifera*, *Crinia glauertis, Geocrinia leai, Heleioporous eyrie, Limnodynastes dorsalis, Litoria adelaidensis, Litoria moorei*, and *Pseudophryne guntheri*. These frog species are not thought to be abundant in this site.

Reptiles

The tiger snake, *Notechis ater* is known to occur in this site

Flora

There are no nationally rare, threatened or endemic wetland plants known at the site. Problematic invasive plants include Bulrush *Typha orientalis* and Arum Lily *Santedeschia aethiopica* are

established in and around the Sabina and Abba Rivers which feed into the Vasse Wonnerup Wetlands. (Appendix 14 – Information Sheet on Ramsar Wetlands, 2009)

The system consists of broad expanses of open water with fringing samphire and rushes. In some areas Melaleuca woodlands occur behind the samphire and eucalypt woodlands are found on higher ground. All the area has been severely disturbed at various times in the past fifty years and much of it is currently cleared for agriculture.

The natural vegetation of the system is fairly uniform. The samphire belt is dominated by *Sarcocornia blackiana* and *Halosarcia pergranulata*. The rush and sedge zone is dominated by *Juncus kraussii* but *Lepidosperma cf. leptostachyum* and *Carex divisa* are also common. The tree zone behind the rushes comprises *Melaleuca rhaphiophylla, M hanmulosa* and *M cuticularis* in either single species or mixed stands*. Gahnia trifida* and *Juncus pallidus* occur in the understory.

3.3 (b) Hydrology, including water flows

The Vasse Wonnerup Estuaries are used as a compensating basin for discharge from four rivers; the Vasse, Abba, Sabina and Ludlow. Floodgates on the exit channels of the Vasse and Wonnerup estuaries are used to manipulate water levels in the estuaries. Levels are lowered during winter to provide storage capacity for river floodwaters, when high sea levels would otherwise prevent their discharge. Floodgates prevent storm surges from causing saltwater inundation of low lying coastal lands adjacent to the estuaries and in the Busselton Township (Appendix 15 - Lane et al. 2007).

3.3 (c) Soil and Vegetation characteristics

The Wonnerup and Vasse Estuaries consist of the following soil types:

i) Treeton Slopes – slopes with gradients generally ranging form 2 – 15% and gravely duplex (forest grove) and pale grey mottled (Mungite) soils.
ii) Quindalup Very Wet Saline Flats – Low lying depressions which are often underwater in winter and saline in summer
iii) Ludlow Vales – Narrow floodplains in small depressions along creeks and rivers. Sandy alluvial soils.
iv) Ludlow Wet Clayey Vales – Narrow floodplains in small depression along creeks and rivers. Clayey alluvial soils
v) Ludlow Flats – floats and very low dunes. Deep yellow brow siliceous sand over limestone.

3.3 (d) Outstanding natural features

NA

3.3 (e) Remnant native vegetation

Native Vegetation
The Vasse-Wonnerup system consists of broad open expanses which are flooded during the winter and may dry completely during summer, with fringing vegetation that is fairly uniform in arrangement. The samphire belt is dominated by *Sarcocornia blackiana* and *Halosarcia pergranulata*, while the dominant sedges and rushes are *Juncus kraussii, Lepidosperma cf. leptostachyum* and *Carex divisa*. The tree line comprises the paperbarks *Melaleuca rhaphiophylla, M. hamulosa and M. cuticularis* in either single species or mixed stands over Coastal Saw Sedge *Gahnia trifida* and Pale Rush *Juncus pallidus*, and paperbark woodlands often give way to open woodlands of Flooded Gum *Eucalyptus rudis*. The vegetation on the Tuart Forest National Park (on the southern side of the system, also part of the listed Ramsar site) is dominated by open forest of mature Tuart *Eucalyptus*

gomphocephala while the Peppermint *Agonis flexuosa* occurs as an understory in the forest. All of the land surrounding the wetland system has been severely disturbed at various times and much of the area is currently cleared for agriculture and used for summer grazing (Appendix 14 – Information Sheet on Ramsar Wetlands, 2009).

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

There is not a significant gradient in the Wonnerup and Vasse Estuaries

3.3 (g) Current state of the environment

Include information about the extent of erosion, whether the area is infested with weeds or feral animals and whether the area is covered by native vegetation or crops.

All of the area surrounding the wetlands has been severely disturbed at various times in the past fifty years. Much of the surrounding area is currently cleared for agriculture.

The Wonnerup and Vasse estuaries are no longer true estuaries because inflow of seawater is prevented by floodgates which were installed across the inlets of the estuaries more than a century ago.

The Vasse Wonnerup system experiences periods of extremely poor water quality, particularly during summer and autumn, when large phytoplankton blooms necessitate the erection of public health warning signs.

Excessive algal blooms in the lower estuary channels have at times resulted in sudden, mass fish deaths, mostly during the summer period. The principal cause of the deaths is thought to be temporary declines in dissolved oxygen concentrations due to night time respiration of algal blooms.

In the surrounding area, urban housing estate development (Port Geographe) has continued to expand in the immediate vicinity of the site.

Feral animals include foxes, mosquito fish *Gambusia affinsis*, *Carp Carassius* species, Redfin perch *Perca fluviatilis* and Goldfish.

Problematic invasive plants include Bulrush *Typha orientalis* and Arum Lily *Santedeschia aethiopica* are established in and around the Sabina and Abba Rivers. (Appendix 14 – Information Sheet on Ramsar Wetlands, 2009)

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

NA

3.3 (i) Indigenous heritage values

The Sabina and Abba Rivers are listed as important mythological Aboriginal heritage sites associated with the Waugal and are protected by the Western Australian Aboriginal Heritage Act, however, these sites do not form a part of the treatment area. Korilya Stud is the only registered aboriginal site within the treatment area.

3.3 (j) Other important or unique values of the environment

Describe any other key features of the environment affected by, or in proximity to the proposed action (for example, any national parks, conservation reserves, wetlands of national significance etc).

3.3 (k) Tenure of the action area (eg freehold, leasehold)

The action area consists of all non-freehold land within the boundaries of the two estuaries. Dryland parts of Nature Reserve 31188, Tuart Forest National Park and the vacant crown land that extends into the estuaries are not included in the action area.

The complete details of lots included within the Vasse-Wonnerup System Ramsar site are listed below.

Lot Details	**Tenure**
Lot 5595 on Plan 54431	Unallocated Crown Land
PIN 11906330	Unallocated Crown Land
Vasse Estuary	None
PIN 528967	Unallocated Crown Land
PIN 528963	Unallocated Crown Land
PIN 528966	Unallocated Crown Land
PIN 526978	Unallocated Crown Land
PIN 1249529	Unallocated Crown Land
PIN 526992	Unallocated Crown Land
PIN 527032	Unallocated Crown Land
Lot 4646 on Plan 11567 Lot 4564 on Plan 9778	Crown Reserve 31188
Lot 4897 on Plan 17494	Crown Reserve 41568
Lot 4975 on Plan 92197 (west of Tuart Drive, Ludlow)	Crown Reserve 40250 (west of Tuart Drive, Ludlow)

3.3 (l) Existing land/marine uses of area

There is urban development along the dunal strip between the Vasse Estuary and the coast. The remainder of the Vasse and Wonnerup Estuaries are surrounded by farmland used principally for cattle grazing. There is little recreational use of the wetlands.

3.3 (m) Any proposed land/marine uses of area

Several small suburban subdivisions are proposed in the areas adjacent to the suburbs in the Geographe Region.

4 Environmental outcomes

Provide descriptions of the proposed environmental outcomes that will be achieved for matters of national environmental significance as a result of the proposed action. Include details of the baseline data upon which the outcomes are based, and the confidence about the likely achievement of the proposed outcomes. Where outcomes cannot be identified or committed to, provide explanatory details including any commitments to identify outcomes through an assessment process.

No significant impact on food chain for migratory waterbirds.

The Environmental Management Plan for Mosquito Control Activities in the Vasse-Wonnerup Wetland System March 2011 (see appendix 35 – Environmental Management Plan, 2011) sets parameters for acceptable and unacceptable changes in non-target macro invertebrate populations. Due to the very high abundance and diversity of aquatic invertebrates in the floodplain areas of the wetland system, some reduction resulting from larvicide use was considered acceptable, because substantial populations would remain and likely recover. The limit of acceptable change was determined as:

> No significant reduction in group-level abundance for any major group that changes its classification status from:
> i) Very high to moderate or less; or
> ii) High to low or absent
>
> Major groups were determined to include: Gastropoda (Mollusca), Chironomidae (Diptera), Ostracoda (Crustacea), Amphipoda (Crustacea), Cladocera (Crustacea), Copepoda (Crustacea), Coleoptera, Hemiptera, Zygoptera
>
> A significant reduction had to be statistically significant and apparent in treated sites only while abundance remained very high or high in control sites. Abundance classification levels were defined accordingly:

Abundance Classification	Description
Very High	>500
High	100 – 500
Moderate	10 – 100
Low	1 – 10
Absent	0

With the abovementioned parameters in mind, the City has monitored non-target macro invertebrate populations in the Vasse Wonnerup Wetlands since 2009. Sampling methodology is detailed in the respective reports (see appendix 19 to 26), and pre and post aerial mosquito treatment samples were undertaken in 3 treatment, and 3 control sites with each application of larvicide. Over seven mosquito seasons, and 22 applications of larvicide, no significant reductions in group-level abundance for any major group of non-target macroinvertebrates was observed at any site, at any stage, or in any capacity whatsoever.

Given the lack of significant impacts upon non-target macro invertebrates over the last seven years of larvicide application, and given the infrequency at which the City applies these larvicides to the Vasse Wonnerup Wetlands (average three per year), and given the wealth of supporting studies available on the lack of non-target impacts associated with Bti and S-Methoprene (see section 3.1(c)), the City considers that the absence of significant non-target impacts has been reasonably established, and non-target macro invertebrate monitoring is no longer necessary.

No significant impact from presence of helicopter.

Waterbird disturbance due to the presence of the helicopter is a potential short term impact which occurs, on average, three times per year. Between 2007 and 2009, the City contracted three different Ecological Consultants to undertake flyover assessments of potential impacts to waterbirds due to helicopter disturbance. While levels of disturbance are hard to quantify, the consultants concurred that any disturbance was minimal, and could be reduced to insignificant by maintaining a 100m buffer from large flocks of nesting or foraging waterbirds.

Furthermore it is worth noting that migratory waders begin to arrive in Vasse Wonnerup Estuary in December, with the highest counts occurring in February. Typically, the mosquito season in Vasse Wonnerup concludes before the end of December, and generally does not coincide with peak bird activities (Elscot 2009).

Prior to each aerial application of larvicide, the City proposes to consult with the Department of Parks and Wildlife, and undertake pre-treatment site inspections of the Ramsar wetlands to establish the location of large congregations of waterbirds. Flight maps will be designed to ensure a minimum 100m buffer is maintained from any significant bird breeding and foraging sites

Decreased mosquito population

Larvicides are highly likely to have a significant impact on target mosquito species. With each application of larvicide the City has undertaken efficacy surveys. Seven years of emergence testing undertaken by the City of Busselton in the Vasse Wonnerup Wetlands has indicated that the application of S-Methoprene is effective in preventing a high percentage (mean = 84%) of adult mosquitos from emerging. Lagadic et al, reported a 90% mosquito larval mortality when Vectobac G (Bti) was applied at label rates to French coastal wetlands. Similarly, the comparison of pre and post treatment larval surveys in the Vasse Wonnerup wetlands has confirmed Bti formulations have had a 95% efficacy on mosquito larvae (Paice 2016)

If a proposed action is determined to be a controlled action, the Department may request further details to enable application of the draft *Outcomes-based Conditions Policy 2015* and *Outcomes-based Conditions Guidance 2015* (http://www.environment.gov.au/epbc/consultation/policy-guidance-outcomes-based-conditions), including about environmental outcomes to be achieved, details of baseline data, milestones, performance criteria, and monitoring and adaptive management to ensure the achievement of outcomes. If this information is available at the time of referral it should be included.

General commitments to achieving environmental outcomes, particularly relating to beneficial impacts of the proposed action, CANNOT be taken into account in making the initial decision about whether the proposal is likely to have a significant impact on a matter protected under the EPBC Act. (But those commitments may be relevant at the later assessment and approval stages, including the appropriate level of assessment, and conditions of approval, if your proposal proceeds to these stages).

5 Measures to avoid or reduce impacts

Note: If you have identified alternatives in relation to location, time frames or activities for the proposed action at Section 2.3 you will need to complete this section in relation to each of the alternatives identified.

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

For any measures intended to avoid or mitigate significant impacts on matters protected under the EPBC Act, specify:

- what the measure is,
- how the measure is expected to be effective, and
- the time frame or workplan for the measure.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

Provide information about the level of commitment by the person proposing to take the action to achieve the proposed environmental outcomes and implement the proposed mitigation measures. For example, if the measures are preliminary suggestions only that have not been fully researched, or are dependent on a third party's agreement (e.g. council or landowner), you should state that, that is the case.

Note, the Australian Government Environment Minister may decide that a proposed action is not likely to have significant impacts on a protected matter, as long as the action is taken in a particular manner (section 77A of the EPBC Act). The particular manner of taking the action may avoid or reduce certain impacts, in such a way that those impacts will not be 'significant'. More detail is provided on the Department's web site.

For the Minister to make such a decision (under section 77A), the proposed measures to avoid or reduce impacts must:

- clearly form part of the referred action (eg be identified in the referral and fall within the responsibility of the person proposing to take the action),
- be must be clear, unambiguous, and provide certainty in relation to reducing or avoiding impacts on the matters protected, and
- must be realistic and practical in terms of reporting, auditing and enforcement.

If a proposed action is determined to be a controlled action, the Department may request further details to enable application of the *Outcomes-based Conditions Policy 2016* (http://www.environment.gov.au/epbc/publications/outcomes-based-conditions-policy-guidance), including information about the environmental outcomes to be achieved by proposed avoidance, mitigation, management or offset measures, details of baseline data, milestones, performance criteria, and monitoring and adaptive management to ensure the achievement of outcomes. If this information is available at the time of referral it should be included in the description of the proposed measures.

More general commitments (e.g. preparation of management plans or monitoring), commitments to achieving environmental outcomes and measures aimed at providing environmental offsets, compensation or off-site benefits CANNOT be taken into account in making the initial decision about whether the proposal is likely to have a significant impact on a matter protected under the EPBC Act. (But those commitments may be relevant at the later assessment and approval stages, including the appropriate level of assessment, if your proposal proceeds to these stages).

Measures to avoid or reduce impacts on food chain for migratory waterbirds.

It has been established that at label application rates the proposed larvicides do not impact on non-target macro invertebrates. The occasional application of these larvicides over small areas of the Vasse Wonnerup Wetlands are therefore highly unlikely to affect the food chain for migratory waterbirds, and the City proposes that non-target macro invertebrate monitoring is no longer necessary.

The Department of Health (WA) have recently negotiated a new contract with Heliwest which included the requirement for new hoppers which had to be fitted with AgNav Granular Flow Controllers (See website: http://agnav.com/granular-flow-controller/). This is a substantial improvement as the AgNav Granular Flow Controllers adjust the flow of chemical from the hoppers automatically in response to wind speed and/or helicopter speed. This is a vast improvement to the old hopper system used in previous seasons, which was reliant on setting the system once for all weather and helicopter speeds, and it couldn't be changed automatically during flights.

At the start of each mosquito season (June/July) the Department of Healht (WA) conduct aerial helicopter calibration experiments with a range of chemical formulations to ensure that the flow of chemical can be adjusted to guarantee larvicide products are landing at the water surface at the specified label rate. Once calibrated, the information is stored in the computer system within the helicopter. It is unlikely any adjustments will need to be made during the season, however, the City of Busselton will check hopper calibration at the start of any field treatment by using catch bags to collect, weigh, and check product output rates.

Impacts on Waterbirds Due to Helicopter Presence

Any impacts on waterbirds due to disturbance caused be the presence of the helicopter is considered unlikely. However, to avoid any unlikely risks, the City proposes to continue with the current procedures of seeking advice from the Department of Parks and Wildlife regarding bird breeding sites at the commencement of each mosquito season, and undertaking surveys of the Vasse Wonnerup Wetlands 24 – 48 hours prior to a proposed aerial application of larvicide. The information from the Department of Parks and Wildlife, and from site surveys, will be collated and used to develop flight maps marked with appropriate 'no fly zones' over identified bird nesting locations. Helicopter pilots will be briefed at the beginning of each treatment, and instructed to maintain a minimum 100m buffer from large flocks of nesting or foraging waterbirds.

6 Conclusion on the likelihood of significant impacts

Identify whether or not you believe the action is a controlled action (ie. whether you think that significant impacts on the matters protected under Part 3 of the EPBC Act are likely) and the reasons why.

6.1 Do you THINK your proposed action is a controlled action?

X	No, complete section 5.2
	Yes, complete section 5.3

6.2 Proposed action IS NOT a controlled action.

Specify the key reasons why you think the proposed action is NOT LIKELY to have significant impacts on a matter protected under the EPBC Act.

- Proposed larvicides have demonstrated no significant non-target impacts in the Vasse Wonnerup Wetlands
- Proposed larvicides have a long international history of high specificity for mosquitos, with no significant non-target impacts.
- The low application rates of larvicide required for effective mosquito control further reduce the risk of any non-target impacts.
- Aerial applications of larvicide are an infrequent occurrence (average three per year), which occur in response to rainfall triggered cohorts.
- Application of larvicide only occurs to a small area (up to 15%) of the Ramsar Wetlands.
- Migratory waders begin to arrive in Vasse Wonnerup Estuary in December, with the highest counts occurring in February. Typically, the mosquito season in Vasse Wonnerup concludes before the end of December, and generally does not coincide with peak bird activities (Elscot 2009).
- Potential impacts on waterbirds due to disturbance by helicopter can be effectively managed with pre larviciding site inspections, and consultation with the local branch of the Department of Parks and Wildlife.
- Other Ramsar areas successfully utilising these actions within SW WA have been considered a controlled action on the basis of pre-existing use.

6.3 Proposed action IS a controlled action

Type 'x' in the box for the matter(s) protected under the EPBC Act that you think are likely to be significantly impacted. (The 'sections' identified below are the relevant sections of the EPBC Act.)

	Matters likely to be impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)

	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

Specify the key reasons why you think the proposed action is likely to have a significant adverse impact on the matters identified above.

7 Environmental record of the responsible party

NOTE: If a decision is made that a proposal needs approval under the EPBC Act, the Environment Minister will also decide the assessment approach. The EPBC Regulations provide for the environmental history of the party proposing to take the action to be taken into account when deciding the assessment approach.

		Yes	No
7.1	**Does the party taking the action have a satisfactory record of responsible environmental management?** **Provide details** The City of Busselton has undertaken larviciding operations for nine years, in strict compliance with conditions set under previous decisions (EPBC2010/5490). The City of Busselton has no prior convictions for breaches of the Environmental Protection Biodiversity Conservation Act 1999, or under the West Australian Environmental Protection Act 1986	X	
7.2	**Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?** **If yes, provide details**		X
7.3	**If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?**	X	

If yes, provide details of environmental policy and planning framework

See Appendix 13 - City of Busselton Environment Policy

Mosquito Control and Minimisation Strategy
The City of Busselton has a 'Mosquito Control and Minimisation Strategy' (see appendix - 12). Council endorsed the Strategy as the basis for the development of future Mosquito Control programs and to provide direction for the City's future efforts in addressing the mosquito problem. The strategy identifies planning mechanisms for the protection, maintenance and enhancement of the wetlands and clearly identifies the mosquito problem, determination of practical objectives of mosquito control operations, and the establishment of a process for evaluating the control program. The strategy was developed to provide a responsible balance that is acceptable to the community, is not detrimental to the environment, and strives to improve Public Health and sustain quality of life. The objectives of the Mosquito Strategy include (but are not limited to):

- reduce residents exposure to disease carrying mosquitoes;
- minimize the use of chemicals for the control of mosquitoes; and
- control mosquitoes using the most cost effective and environmentally safe methods available

City of Busselton Environment Policy
The 'City of Busselton Environment Policy' requires that decisions and activities of the Council will have regard to relevant environmental legislation and be based upon recognised best practise environmental management strategies. The mosquito control and minimisation strategy has been prepared with this view firmly in mind and the implementation of the strategy will abide by these principals.

Busselton Wetlands and Conservation Strategy (Oct 2005).
The Western Australian Planning Commission developed the Busselton Wetlands and Conservation Strategy in collaboration with the Department of Conservation and Land Management, the Department of Environment Regulation, the Department of Agriculture, the Water Corporation, the City of Busselton and Geocatch. The strategy states that a long term mosquito management program to minimise the incidence of RRV and Barmah Forest Virus exposure should be considered in conjunction with the City of Busselton.

7.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?**	X	

Provide name of proposal and EPBC reference number (if known) • Larviciding and adulticiding in mosquito breeding wetlands in and adjacent to the Vasse Wonnerup Wetlands, Busselton WA EPBC 2010/5593 • Aerial application of larviciding and barrier fogging in the Vasse Wonnerup Wetland WA EPBC 2010/5490 • Aerial Mosquito Spraying Vasse-Wonnerup System EPBC 2005/1952 • Busselton Foreshore Redevelopment EPBC 2013/6830		

8 Information sources and attachments

(For the information provided above)

8.1 References

- List the references used in preparing the referral.
- Highlight documents that are available to the public, including web references if relevant.

Lindsay, M (2004) Correspondence to the City of Busselton Larviciding of Ramsar Wetlands Within the Shire of Busselton (Appendix 1)

Ross River Virus Disease Notification Data Supplied by the Department of Health 2016 (Appendix 2)

Wright, A (1998) Busselton Mosquito Survey Interim Report and Preliminary Mosquito Control Recommendations (Appendix 3)

Australian Pesticides and Vetenary Medicines Authority Permit to Allow Minor Use of Agvet Chemical Product For Control of Winter Salt Marsh Mosquito in Estuary and Tidal Flow Areas, Salt Marshes, Storm-Water Retention Areas and Seasonally Inundated Basins Permit No PER13525 (Appendix 6)

Prolink Prosand Mosquito Growth Regulator Product Label (Appendix 7)

Vectobac G Biological Larvicide Product Label (Appendix 8)

Vectobac G Biological Larvicide Material Safety Data Sheet (Appendix 9)

Prolink Prosand Mosquito Growth Regulator Material Safety Data Sheet (Appendix 10)

Aqua K Otherine Material Safety Data Sheet and Product Label (Appendix 11)

City of Busselton Mosquito Control and Minimisation Strategy (Appendix 12)

City of Busselton Environment Policy 2011 (Appendix 13)

Information Sheet on Ramsar Wetlands (RIS) DEWHA (2009) Vasse Wonnerup System, Western Australia. (Appendix 14) Accessed online 11/07/2016 at http://www.environment.gov.au/water/topics/wetlands/database/pubs/38-ris.pdf

Lane, J et al (2007) Waterbirds of the Vasse Wonnerup Wetlands in 1998 – 2000 Including Ramsar Status and Comparisons with Earlier Data (Appendix 15)

Elscot, S (2009) Aerial Larvicide Application in the Vasse Wonnerup Wetland System: Reducing Impacts on Waterbirds (Appendix 16)

Bamford & Doyle (2008) Monitoring of the Effect Upon Waterbirds of Spraying Larvicide by Helicopter on the Vasse Wonnerup Estuary (Appendix 17)

Rutherford W (2007) Field notes on waterbird reactions to helicopter in the Vasse Wonnerup Wetlands (Appendix 18)

Paice, R (2016) Assessment of Mosquito Larvicide Impacts on Aquatic Invertebrates in the Vasse-Wonnerup Wetland System 2009 – 2015 (Appendix 19)

Paice, R (2010) Potential of aerial larvicide applications to impact on aquatic invertebrate prey species for waterbirds in the Vasse Wonnerup Wetland System (Appendix 20)

Paice, R (2011) Impact of aerial larvicide on aquatic invertebrates in the Vasse Wonnerup Wetland System Results of 2010 monitoring (Appendix 21)

Paice, R (2012) Impact of aerial larvicide for mosquito control on aquatic invertebrates in the Vasse Wonnerup Wetland System: Results of 2011 – 2012 monitoring (Appendix 22)

Paice, R (2013) Impact of aerial larvicide for mosquito control on aquatic invertebrates in the Vasse Wonnerup Wetland System: results of 2012 sampling (Appendix 23)

Paice, R (2014) Impact of aerial larvicide for mosquito control on aquatic invertebrates in the Vasse Wonnerup Wetland System: results of 2013 sampling (Appendix 24)

Paice, R (2015) Impact of aerial larvicide for mosquito control on aquatic invertebrates in the Vasse Wonnerup Wetland System: results of 2014 sampling (Appendix 25)

Paice, R (2016) Impact of aerial larvicide for mosquito control on aquatic invertebrates in the Vasse Wonnerup Wetland System: results of 2015 sampling (Appendix 26)

Lagadic, L et al (2016) No association between the use of Bti for mosquito control and the dynamics of non-target aquatic invertebrates in French coastal and continental wetlands (Appendix 27)

Lundstrom, J et al (2009) Production of wetland Chironomidae (Diptera) and side effects of using Bacillus thuringiensis israelensis for mosquito control (Appendix 28)

Marina, C et al (2014) Efficacy and non-target impact of spinosad, Bti and temephos larvicides for control of Anopheles spp. In an endemic malaria region of southern Mexico (Appendix 29)

Stark, J (2005) A review and update of the report "Environmental and health impacts of Bacillus thuringiensis israelensis" 1998 by Travis R Glare and Maureen O'Callaghan (Appendix 30)

Pinkney, A et al (2000) Effects of the mosquito larvicides temephos and methoprene on insect populations in experimental ponds (Appendix 31)

Russell, T et al (2009) Environmental effects of mosquito insecticides on saltmarsh invertebrate fauna (Appendix 32)

Butler, M et al (2010) Evaluation of nontarget effects of methoprene applied to catch basins for mosquito control (Appendix 33)

Henrick, C (2007) Methoprene excerpt from Journal of the American Mosquito Control Association (Appendix 34)

Beatty, S. Et al (2014) Introduced and Native Fishes in the Vasse Wonnerup Wetlands System and its River

8.2 Reliability and date of information

For information in section 3 specify:

- source of the information;
- how recent the information is;
- how the reliability of the information was tested; and
- any uncertainties in the information.

The information in section 3 has been appropriately referenced, and the associated studies have been included as appendices to this referral. Of the thirteen studies and articles sited in Section 3, eleven were published and/or completed in the last ten years.

The majority of studies referenced in Section 3 have been published in scientific journals. Some reference material was sourced from the Australian Department of Environment website, and some has been sourced from studies on the Vasse Wonnerup Wetlands undertaken by Dr Robyn Paice on behalf of the City of Busselton. Dr Robyn Paice has completed her PhD in Freshwater Ecology at Murdoch University on the Role of Submerged Macrophytes in Seasonally flowing Agricultural Streams. For a list of published studies completed by Dr Robyn Paice see http://researchrepository.murdoch.edu.au/cgi/search/simple?_action_search.x=45&_action_search.y=28&_action_search=Search&q=paice&_action_search=Search&_order=bytitle&basic_srchtype=ALL&_satisfyall=ALL

8.3 Attachments

Indicate the documents you have attached. All attachments must be less than three megabytes (3mb) so they can be published on the Department's website. Attachments larger than three megabytes (3mb) may delay the processing of your referral.

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	√	Map 2 - location
	GIS file delineating the boundary of the referral area (section 1)	√	
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	√	Map 3 – mosquito breeding areas within Vasse Wonnerup
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)	NA	
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)	√	Copy of approval decision EPBC2010/5593 attached appendix 5
	copies of any flora and fauna investigations and surveys (section 3)	√	Appendix 14 Appendix 15 Appendix 16 Appendix 19-26 Appendix 37
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3 and 4)		Appendix 16 - 34
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)	NA	

9 Contacts, signatures and declarations

NOTE: Providing false or misleading information is an offence punishable on conviction by imprisonment and fine (s 489, EPBC Act).

Under the EPBC Act a referral can only be made by:

- the person proposing to take the action (which can include a person acting on their behalf); or
- a Commonwealth, state or territory government, or agency that is aware of a proposal by a person to take an action, and that has administrative responsibilities relating to the action[1].

Project title:

9.1 Person proposing to take action

This is the individual, government agency or company that will be principally responsible for, or who will carry out, the proposed action.

If the proposed action will be taken under a contract or other arrangement, this is:

- the person for whose benefit the action will be taken; or
- the person who procured the contract or other arrangement and who will have principal control and responsibility for the taking of the proposed action.

If the proposed action requires a permit under the Great Barrier Reef Marine Park Act[2], this is the person requiring the grant of a GBRMP permission.

The Minister may also request relevant additional information from this person.

If further assessment and approval for the action is required, any approval which may be granted will be issued to the person proposing to take the action. This person will be responsible for complying with any conditions attached to the approval.

If the Minister decides that further assessment and approval is required, the Minister must designate a person as a proponent of the action. The proponent is responsible for meeting the requirements of the EPBC Act during the assessment process. The proponent will generally be the person proposing to take the action[3].

1. Name and Title:	
	City of Busselton
2. Organisation (if applicable):	
	As above
3. EPBC Referral Number (if known):	
4: ACN / ABN (if applicable):	ABN 87285608991
5. Postal address	Locked Bag 1 Busselton WA 6280
6. Telephone:	(08) 9781 0334
7. Email:	peter.horgan@busselton.wa.gov.au
8. Name of proposed proponent (if not the same person at item 1 above and if applicable):	
9. ACN/ABN of proposed	

[1] *If the proposed action is to be taken by a Commonwealth, state or territory government or agency, section 8.1 of this form should be completed. However, if the government or agency is aware of, and has administrative responsibilities relating to, a proposed action that is to be taken by another person which has not otherwise been referred, please contact the Referrals Gateway (1800 803 772) to obtain an alternative contacts, signatures and declarations page.*

[2] *If your referred action, or a component of it, is to be taken in the Great Barrier Reef Marine Park the Minister is required to provide a copy of your referral to the Great Barrier Reef Marine Park Authority (GBRMPA) (see section 73A,* EPBC Act*). For information about how the GBRMPA may use your information, see http://www.gbrmpa.gov.au/privacy/privacy_notice_for_permits.*

proponent (if not the same person named at item 1 above):

COMPLETE THIS SECTION ONLY IF YOU QUALIFY FOR EXEMPTION FROM THE FEE(S) THAT WOULD OTHERWISE BE PAYABLE

I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

□ an individual; OR

□ a small business entity (within the meaning given by section 328-110 (other than subsection 328-119(4)) of the *Income Tax Assessment Act 1997*); OR

□ not applicable.

If you are small business entity you must provide the Date/Income Year that you became a small business entity:

Note: You must advise the Department within 10 business days if you cease to be a small business entity. Failure to notify the Secretary of this is an offence punishable on conviction by a fine (regulation 5.23B(3) *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth)).

COMPLETE THIS SECTION ONLY IF YOU WOULD LIKE TO APPLY FOR A WAIVER

I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations. Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made:

□ not applicable.

Declaration

I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.
I understand that giving false or misleading information is a serious offence.
I agree to be the proponent for this action.
I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature 

Date 2 Sept 2016

9.2 Person preparing the referral information (if different from 8.1)

Individual or organisation who has prepared the information contained in this referral form.

Name	Peter Horgan
Title	Environmental Health Officer
Organisation	City of Busselton
ACN / ABN (if applicable)	87285608991
Postal address	Locked Bag 1 Busselton WA 6280

Telephone	(08) 9781 0334
Email	peter.horgan@busselton.wa.gov.au
Declaration	I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct. I understand that giving false or misleading information is a serious offence.
Signature	 Date 16th Sept 2016

REFERRAL CHECKLIST

NOTE: This checklist is to help ensure that all the relevant referral information has been provided. It is not a part of the referral form and does not need to be sent to the Department.

HAVE YOU:

- ❑ Completed all required sections of the referral form?
- ❑ Included accurate coordinates (to allow the location of the proposed action to be mapped)?
- ❑ Provided a map showing the location and approximate boundaries of the project area?
- ❑ Provided a map/plan showing the location of the action in relation to any matters of NES?
- ❑ Provided a digital file (preferably ArcGIS shapefile, refer to guidelines at Attachment A) delineating the boundaries of the referral area?
- ❑ Provided complete contact details and signed the form?
- ❑ Provided copies of any documents referenced in the referral form?
- ❑ Ensured that all attachments are less than three megabytes (3mb)?
- ❑ Sent the referral to the Department (electronic and hard copy preferred)?

Attachment A

Geographic Information System (GIS) data supply guidelines

If the area is less than 5 hectares, provide the location as a point layer. If the area greater than 5 hectares, please provide as a polygon layer. If the proposed action is linear (eg. a road or pipline) please provide a polyline layer.

GIS data needs to be provided to the Department in the following manner:

- Point, Line or Polygon data types: ESRI file geodatabase feature class (preferred) or as an ESRI shapefile (.shp) zipped and attached with appropriate title
- Raster data types: Raw satellite imagery should be supplied in the vendor specific format.
- Projection as GDA94 coordinate system.

Processed products should be provided as follows:

- For data, uncompressed or lossless compressed formats is required - GeoTIFF or Imagine IMG is the first preference, then JPEG2000 lossless and other simple binary+header formats (ERS, ENVI or BIL).
- For natural/false/pseudo colour RGB imagery:
    - If the imagery is already mosaiced and is ready for display then lossy compression is suitable (JPEG2000 lossy/ECW/MrSID). Prefer 10% compression, up to 20% is acceptable.
    - If the imagery requires any sort of processing prior to display (i.e. mosaicing/colour balancing/etc) then an uncompressed or lossless compressed format is required.

Metadata or 'information about data' will be produced for all spatial data and will be compliant with ANZLIC Metadata Profile. (http://www.anzlic.org.au/policies_guidelines#guidelines).

The Department's preferred method is using ANZMet Lite, however the Department's Service Provider may use any compliant system to generate metadata.

All data will be provide under a Creative Commons license (http://creativecommons.org/licenses/by/3.0/au/)