Government of **Western Australia**
Department of **Water and Environmental Regulation**

Environmental offsets metric: Quantifying environmental offsets in Western Australia

Department of Water and Environmental Regulation
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Contents

1 Introduction

1.1 Purpose

This guideline should be read in conjunction with the *WA Environmental Offsets Calculator* (offsets calculator), collectively referred to as the WA environmental offsets metric.

They form a supplement to section 4 of the *WA Environmental Offsets Guidelines*[1] (offsets guidelines) and provide information to help decision-makers, government officers, industry and the community to quantify environmental offsets. The offsets guidelines (2014) committed to developing metrics for determining offsets.

The WA environmental offsets metric was refined in consultation with stakeholder working groups from a calculator and guide in use under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) since 2012.

This guideline and the offsets calculator will ensure transparency and consistency in the quantification of offsets under parts IV and V of the *Environmental Protection Act 1986* (EP Act) and other relevant legislation. The WA environmental offsets metric is broadly consistent with the EPBC Act calculator and guide previously in use in Western Australia (WA).

Application of this guideline

This guideline applies to all land-based biodiversity offsets required as a condition of EP Act approvals and sets out the approach for applying the offsets calculator in both the intensive and extensive land use zones (Figure 1). This guideline also applies to the determination of environmental offsets by the state under bilateral agreements with the Australian Government and the Government of Western Australia under the EPBC Act.

Section 2 of this guideline applies across WA, excluding those proposals which use the Pilbara Environmental Offsets Fund (see the *Pilbara Environmental Offsets Fund implementation plan*). In the extensive land use zone, the calculator should be applied in the first instance. Where this is not appropriate, proponents and applicants should discuss offset quantification options with the regulator.

Research offsets (only available to proposals assessed under Part IV of the EP Act) do not use this guideline or offsets calculator. Instead, research offsets should be developed to meet an agreed outcome through discussions with the regulatory agency. In developing a research offset, the proponent must set out the components associated with the research, including a description of how it relates to the impact, and cost estimates to deliver the outcome. The regulatory agency will assess these on a case-by-case basis.

[1] Government of Western Australia 2014, *WA Environmental Offsets Guidelines*, August 2014, Government of Western Australia.

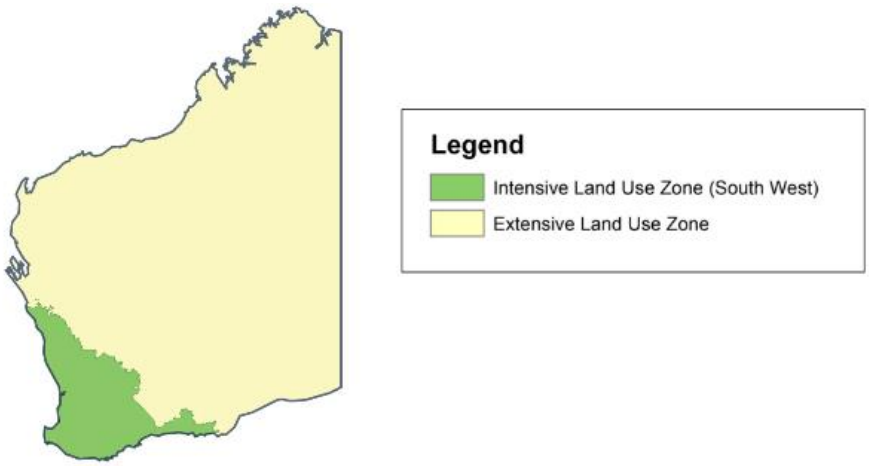

Figure 1: Intensive and extensive land use zones in Western Australia

1.2 WA Environmental Offsets Calculator

This document assumes the requirement for offsets has already been determined in accordance with the offsets guidelines.

The offsets calculator uses a balance-sheet approach to quantify significant impacts, rehabilitation credits and the environmental benefits of proposed offsets in a macro-based Excel spreadsheet with embedded formulas. It is a quantitative tool intended to help determine the minimum offset required to address the significant residual impact identified for an environmental value.

The offsets calculator can be used for any biodiversity value requiring an offset, including species and ecological communities considered to be matters of national environmental significance. It also includes a rehabilitation credit calculation to acknowledge the importance of onsite rehabilitation in reducing the environmental impact of a particular project.

Before using the offsets calculator, the user must understand the environmental values and significant impacts required to be offset, and have details of the offsets proposed: this will help them apply meaningful scores to the calculations. This information may be obtained through decision documents or through discussion with the regulatory agency, and through the user's research and experience.

In addition to completing the offsets calculator, the user must complete the rationale template (see Appendix C) to explain why particular scores have been selected. Scores may be selected based on literature, decision documents or discussions with the regulatory agency. Where success (completion) criteria or rehabilitation or offsets plans are developed in the assessment process, or are included as conditions of approval, these scores must be reflected in the offsets calculator.

1.3 Review

To identify any need for improvement, a review of the metric's effectiveness will begin 12 months after its implementation.

2 Using the offsets calculator

This section sets out what inputs are required for the offsets calculator and how to determine appropriate values.

The offsets calculator comprises the following steps/components:

Step	Component
Step 1: Determining conservation significance	Conservation significance determination
Step 2: Calculating significant residual impact	Part A: Significant impact calculation • *area* or *feature* Part B: Rehabilitation credit calculation • *area* or *feature* Part C: Significant residual impact calculation • *area* or *feature*
Step 3: Calculating offsets	Offsets calculation – land acquisition/on-ground management • *area* or *feature*

The correct use of the offsets calculator relies on the user completing each of the above steps in sequence. Separate calculations should be undertaken where more than one environmental value is significantly impacted by a project.

To set up the correct calculation, the user must choose to complete the offsets calculator in ***area*** or ***feature*** mode. This is based on whether the impacts are quantified as either the *area* impacted in hectares, such as the extent of vegetation, or as the number of a type of *feature* impacted, such as the number of trees. The component most relevant to the impact on the environmental value should be selected; the offsets calculator is not designed to consider both *area* and *feature* components in the same calculation. In this regard, the user must:

- determine whether *area* or *feature* is appropriate to the environmental value impacted by a project
- ensure this choice is consistently applied throughout the calculations with respect to a particular environmental value; for example, when the *significant impact calculation* is quantified as an *area*, all subsequent calculations are also quantified as an *area*.

To ensure the consistent application of *area* or *feature* calculations, step 1 includes a prompt to select either *area* or *feature* from the drop-down list. Depending on the selection, the offsets calculator hides the alternative (*area* or *feature*) calculations.

There is some repetition between the *area* and *feature* modes in each subsection, however this is needed to ensure clarity of process for each mode.

As part of an offsets proposal, the user must submit a rationale for each score they put in the offsets calculator. A form is provided at Appendix C for this purpose.

To help with data entry, cells within the offsets calculator are colour-coded as follows:

 **Data to be entered** – the user must enter scores into these cells

 **Drop-down selection** – the user must select an option from the list

 **Automatically-generated scores** – automatic (no user input required)

The offsets calculator is a macro-based Excel spreadsheet. Macros must be enabled for the calculator to work. The macros included in the offsets calculator are:

- a **Clear Data** button near the top of each of the step 1, step 2 and step 3 worksheets, which resets the yellow cells within each step
- a **What-if Analysis** button adjacent to each of the *offset value* scores in the step 3 *area* and *feature* calculations, which reverse-calculates the minimum offset required to achieve an *offset value* of 100 per cent (after all scores have been inserted) by adjusting:
  - the *proposed offset (area in hectares)* score for area
  - the *future number with offset* score for feature
- a **Reinstate Formula** button adjacent to the *offset value* score in the step 3 *area* calculation (only applies to environmental values that are a conservation area), which must be run at the conclusion of any calculation for which an offset ratio is entered to enable the worksheet to be re-used.

2.1 Step 1: Determining conservation significance

The first step in the calculator involves determining the *conservation significance score* for the environmental value that is being impacted. In general terms, environmental values with greater conservation significance will require a larger offset. Determining the *conservation significance score* requires the user to select the relevant environmental value. This sets up the calculation that will apply.

The user sees the following screen (Figure 2).

Conservation significance determination for the environmental value impacted		
Conservation significance	**Description**	
	Type of environmental value	[drop-down list]
	Conservation significance of environmental value	[drop-down list]
	Conservation significance score	

Please select 'Area' or 'Feature' for the calculations	[drop-down list]

Figure 2: Conservation significance calculation component of the offsets calculator

Description

The user must enter a brief description of the environmental value being impacted. For example, Carnaby's cockatoo foraging habitat, *Conospermum undulatum* (wavy-leaved smokebush), conservation park.

Type of environmental value

The user must select the environmental value from the drop-down list. Options include:

- species (flora/fauna)
- ecological community
- wetland/watercourse
- vegetation/habitat
- conservation area.

Landscape values do not appear in the drop-down list but if impacted, should be addressed by an offset.

Conservation significance of environmental value

The user must select an option from the drop-down list. This list relates to each *type of environmental value*. Options for species (flora/fauna) include:

- rare/threatened species – critically endangered
- rare/threatened species – endangered
- rare/threatened species – vulnerable
- priority species
- other species.

Options for ecological community include:

- threatened ecological community – critically endangered
- threatened ecological community – endangered
- threatened ecological community – vulnerable
- priority ecological community
- other ecological community.

For environmental values within the categories of species (flora/fauna) and ecological community, the option selected must relate to the level of threat for that particular environmental value.

The level of threat is informed using the International Union for Conservation of Nature (IUCN) Red List criteria or the state's ranking. Where the Commonwealth and state ranking are inconsistent for a particular species or ecological community, the highest level of threat should be used.

Levels of threat can be found at:

- IUCN: www.iucnredlist.org/technical-documents/categories-and-criteria
- Threatened and priority flora:

  State: www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

  Commonwealth: www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora

- Threatened and priority fauna:

  State: www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals

  Commonwealth: www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=fauna

- Threatened and priority ecological communities:

  State: www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/wa-s-threatened-ecological-communities

  Commonwealth: www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl

If a level of threat is not applicable for a particular species or ecological community, 'other species' or 'other ecological community' (as appropriate) should be selected.

Options for wetland/watercourse include:

- vegetation associated with a wetland or watercourse for which an offset is required
- a category or type of wetland or watercourse for which an offset is required.

Options for vegetation/habitat include:

- terrestrial native vegetation complex – <30 per cent extent remaining in the bioregion
- terrestrial native vegetation complex – <10 per cent extent remaining in a constrained area
- habitat supporting migratory species (e.g. listed in the JAMBA, CAMBA or RoKAMBA)
- vegetation/habitat representative of high biodiversity.

Options for conservation area include:

- crown reserve established under the *Conservation and Land Management Act 1984* and/or the *Land Administration Act 1997* for the purpose of conservation
- conservation covenant
- Bush Forever site
- other conservation area.

Conservation significance score

The conservation significance score is automatically generated based on the type of environmental value and the conservation significance of the environmental value selected. The conservation significance score has the effect of increasing the offsets requirement depending on the conservation significance of the environmental value impacted. The conservation significance score also has a similar effect on the rehabilitation credit calculation and the significant residual impact calculation (step 2).

For environmental values within the categories of species (flora/fauna), ecological community, wetland/watercourse and vegetation/habitat:

- where a level of threat/ranking applies for environmental values within the categories of species (flora/fauna) and ecological community, the *conservation significance score* is calculated as the likelihood of extinction plus the probability of catastrophe at the different threat levels (ranging from 0.2 per cent to 6.8 per cent)
- where a level of threat/ranking does not apply, the *conservation significance score* is the probability of catastrophe only (0.1 per cent)
- through discussion with the regulator, a modified *conservation significance score* may be manually entered as a percentage where warranted for a particular environmental value – as part of their offsets proposal the user must submit a rationale for the modified *conservation significance score*.

Where the environmental value is a conservation area, the *conservation significance score* field states ‘a conservation significance score does not apply in this case; an offset ratio may be appropriate (step 3)’. This is because the likelihood of extinction or probability of catastrophe does not apply; instead a multiplier (offset ratio) set by the regulatory agency may be appropriate.

See Appendix A for examples of environmental values that may require offsetting, and go to step 3 for information on how offsets ratios are applied to environmental values within the category of conservation area.

Landscape-scale values

In addition to the more site-specific environmental values discussed in this section, the impact assessment process sometimes determines that landscape-scale values (such as ecological linkages, corridors or remnant vegetation that are significant in a highly cleared landscape) are part of the significant residual impact. These values are not easily quantified by 'area' or 'feature' but should also be addressed by an offset. This could be done through offset site selection which improves the connectivity of fragmented habitat.

A landscape-level values row is included in the offset rationale (see Appendix C) to enable a manual check to ensure the offset proposal addresses landscape-level values where relevant.

Please select 'area' or 'feature' for the calculations

At this point, the user must determine whether the environmental value is best considered based on the area of impact (*area*) or based on the number of features impacted (*feature*), and only complete the relevant calculations.

Note: Activating the 'clear data' macro (button at the top of step 1) will delete the content of the yellow cells.

2.2 Step 2: Calculating significant residual impact

Step 2 consists of three parts and calculates the quantum of the impact at the project site (part A), the credit for any onsite rehabilitation (part B), and the significant residual impact (part C).

Part A: Significant impact calculation

Part A requires the user to determine the extent and current quality of the project site, before any impact. This establishes a baseline against which the gross impact on the environmental value can be determined.

Quantum of impact calculation – area

When *area* is selected in step 1, the user sees the following screen (Figure 3).

Part A: Significant impact calculation *Area*			
Significant impact	**Description**	**Quantum of impact**	
		Significant impact (hectares)	
		Quality (scale)	
		Total quantum of impact	

Figure 3: Significant impact calculation for area

Description

The user must enter a brief description of the nature of the significant impact to the environmental value. While brief, the description should clearly identify the significant impact. For example, clearing of native vegetation for farming, filling of a wetland for road construction, or clearing of breeding trees for particular species.

Significant impact (hectares)

The user must enter the spatial extent of the impact as relevant to the environmental value, as the area in hectares. This is not necessarily the entire footprint of the impact, only the footprint of the significant residual impact. For example, if a project impacts on 20 hectares, of which 15 hectares is cleared land and 5 hectares is habitat for a threatened species, 5 hectares is entered.

Quality (scale)

Appendix A has information on the various aspects that must be considered in determining a *quality* score. Most importantly, the method for determining *quality* must be consistently applied across all calculations relating to a particular environmental value, and should reflect the site's importance for the environmental value being impacted.

The user must determine the site's *quality* score before impact and rate its importance between 0 and 10 as relevant to the environmental value identified in step 1, where '0' is an area with no importance and '10' is an area with the highest-possible importance. In this context, *quality* is a measure of how well a particular site supports a particular environmental value (i.e. the ecological requirements of the environmental value), and contributes to its ongoing viability. The determination of quality must consider the factors of vegetation condition, site context, and habitat value.

Where the environmental value is a 'crown reserve managed under the *Conservation and Land Management Act 1984* and/or for the purpose of conservation', *quality* (for part A only) is considered in the context of how well the site meets the criteria for that

particular type of reservation and must be entered as a score of '10'. For these areas, an automatic reminder is generated adjacent to the *quality* field in part A.

Total quantum of impact

The user is not required to enter information for this field. The *total quantum of impact* is automatically calculated based on the data entered. For *area*, this is calculated by multiplying the *significant impact* by the *quality* score.

Quantum of impact calculation – feature

When *feature* is selected in step 1, the user sees the following screen (Figure 4).

Part A: Significant impact calculation ***Feature***			
Significant impact	**Description**	**Quantum of impact**	
		Type of feature	**Number**
		Total quantum of impact	

Figure 4: Significant impact calculation for feature

Description

The user must enter a brief description of the nature of the significant impact to the environmental value.

Type of feature

The user must enter a short description of the type of feature being considered. For example, number of hollows, number of trees of breeding capacity, or number of individuals. The *type of feature* must be applied consistently across all steps.

Number

The user must enter the number of the feature that will be impacted by the project.

Total quantum of impact

The user is not required to enter information for this field. The *total quantum of impact* is automatically calculated based on the data entered. For *feature*, this is the *number* of the *type of feature* impacted.

Part B: Rehabilitation credit calculation

The *rehabilitation credit* requires the user to determine the environmental value of any onsite rehabilitation which reduces the significant impacts of a project. Rehabilitation includes revegetation and other on-ground management activities to improve the quality of existing native vegetation.

To be included in the rehabilitation credit calculation, it must be undertaken in accordance with a plan approved as part of a clearing permit, Ministerial Statement or approval under the *Mining Act 1978*[2]. The *rehabilitation credit* would usually be used where the clearing is temporary and rehabilitation is of sufficient quality to return biodiversity values to the site. Generally, a rehabilitation credit will not apply for natural regeneration in the absence of active onsite on-ground management, except in circumstances when encouraging natural regeneration is a requirement of approval. The values entered into the rehabilitation part of the calculation should be consistent with the outcomes expected to be achieved in conditions of approval.

If onsite rehabilitation is not proposed for an impact site, the fields in the *rehabilitation credit calculation* components must be left blank.

Rehabilitation credit calculation - area

When *area* is selected in step 1, the user sees the following screen (Figure 5).

<table>
<tr><th colspan="6">Part B: Rehabilitation credit calculation
Area (Onsite)</th></tr>
<tr><td rowspan="5">Rehabilitation credit</td><td>Description</td><td>Proposed rehabilitation (area in hectares)</td><td></td><td>Time until ecological benefit (years)</td><td></td></tr>
<tr><td rowspan="4"></td><td>Current quality of rehabilitation site (scale)</td><td></td><td>Confidence in rehabilitation result (%)</td><td></td></tr>
<tr><td>Future quality WITHOUT rehabilitation (scale)</td><td></td><td rowspan="2">Rehabilitation credit</td><td rowspan="2"></td></tr>
<tr><td>Future quality WITH rehabilitation (scale)</td><td></td></tr>
</table>

Figure 5: Rehabilitation credit calculation for area

Description

The user must enter a brief description of the onsite rehabilitation taking place.

Proposed rehabilitation (area in hectares)

The user must enter the area in hectares that will be subject to onsite rehabilitation following impact. Where the type of rehabilitation, effort or likely success will differ across the site, the user must either:

- enter the total area being rehabilitated and apply an average score for the other values, or
- enter the different areas of rehabilitation separately.

[2] This may relate to rehabilitation that is part of a project approved via a Ministerial Statement where the rehabilitation component is regulated by an approval under the *Mining Act 1978* (see the Department of Mines, Industry Regulation and Safety *Statutory guidelines for mine closure plans*).

For example, a mine site has many different aspects to it such as the mine pit, access tracks, and waste rock dump. Given the success rate for rehabilitation of each of these areas varies, it may be appropriate to separate them if a significantly different outcome is likely.

Quality (scale) – current, future without rehabilitation and future with rehabilitation

The user must enter three scores: *current quality of rehabilitation site*, *future quality without rehabilitation*, and *future quality with rehabilitation*. *Quality* scores must be determined using the same method as that used in step 1. *Quality* scores must be between 0 and 10 as relevant to the environmental value identified in step 1, where '0' is an area with no importance and '10' is an area with highest importance. The determination of quality must consider the factors of vegetation condition, site context, and habitat value.

An improvement in the quality of a site over time is a key means to achieve a conservation gain for the environmental value that is being impacted. Where completion criteria for proposed revegetation or rehabilitation are available during the assessment process, the *future quality with rehabilitation* score must be consistent. For example, if the completion criteria state that revegetation or rehabilitation will achieve a future quality of '5', the *future quality with rehabilitation* score must be the same.

Revegetation/rehabilitation may aim to restore only those significant environmental values impacted, rather than all ecosystem values of a particular site. This limitation should be reflected in the *future quality* and *confidence in rehabilitation result*.

Appendix A has information on the various aspects that must be considered in determining a *quality* score.

Current quality

This should be considered as the quality of the rehabilitation site after the significant environmental impact has occurred. In cases where the site has been fully cleared or impacted by the project, this score will be low, but should consider site context and habitat value for the environmental value. The score would be higher where a project only partially impacts the environmental value, or the site provides connectivity to existing native vegetation; for example, where vegetation has been flattened by machinery to create access for exploration drilling.

Future quality without rehabilitation

This should be considered as the quality of the rehabilitation site in the foreseeable future (20 years), after the project is complete and assuming no rehabilitation was to occur. In many cases this score will be the same as *current quality* because the environmental value will not recover without rehabilitation.

However there may be circumstances, such as temporary flattening of vegetation, where the environmental value will partly or fully recover.

Future quality with rehabilitation

This should be considered as the quality of the rehabilitation site in the foreseeable future (20 years), after the proposed onsite rehabilitation is complete. This must take into account the likely quality at the time the rehabilitation activities finish. This should be considered at the same point in time as the *future quality without rehabilitation*.

The *future quality with rehabilitation* score should be based on demonstrated success and/or scientific evidence; for example, current best-practice techniques and positive research outcomes for those techniques for the vegetation type or feature being rehabilitated. In the absence of supporting evidence, a score of not greater than '5' is generally the maximum applied.

Time until ecological benefit (years)

Time until ecological benefit relates to the estimated time difference between the impact and when the environmental benefit of the rehabilitation will be realised. The user must take into account when rehabilitation will begin; for example, the delay in commencement until such time as the site is no longer required for the purpose for which it was impacted. This is also influenced by the time over which the rehabilitation can be expected to return an ecological benefit.

Time until ecological benefit is linked to *future quality*, as this represents the time period by which the outcome will be achieved. *Time until ecological benefit* becomes particularly significant when growing trees for nesting hollows as it may take more than 100 years for a tree to form hollows.

See Appendix A for examples of how to estimate the *time until ecological benefit*.

Confidence in rehabilitation result (percentage)

The user must enter, as a percentage, the level of certainty that the proposed rehabilitation outcome will be achieved. This relates to the *future quality* scores.

Confidence in rehabilitation result should take into account the strength and effectiveness of the proposed measures, the capacity of these measures to mitigate the risk of total loss of the site, and the ability of the proponent or applicant to achieve the predicted result. For example, a commitment to achieving 100 per cent of original species diversity through rehabilitation is likely to have a low confidence level due to variability in revegetation result. On the other hand, a commitment to achieving 50 per cent of original species diversity through rehabilitation is likely to have a high confidence level, as this has a higher likelihood of being achieved.

For rehabilitation, the *confidence in rehabilitation result* score must also consider the number of years over which it will be actively implemented and any risk to the long-term success of the rehabilitation after the proponent or applicant finishes. Where the *time until ecological benefit* is longer than the timeframe the proponent or applicant will undertake rehabilitation, the site's security and long-term viability without further intervention must be considered. Where evidence of previous

demonstrated success is provided, this will form the basis for the *confidence in rehabilitation result* score assigned.

See Appendix A for examples of how to estimate the *confidence in rehabilitation result*.

Rehabilitation credit

The user is not required to enter information for this field. The *rehabilitation credit* is automatically calculated based on the data entered.

Rehabilitation credit calculation - feature

When *feature* is selected in step 1, the user sees the following screen (Figure 6).

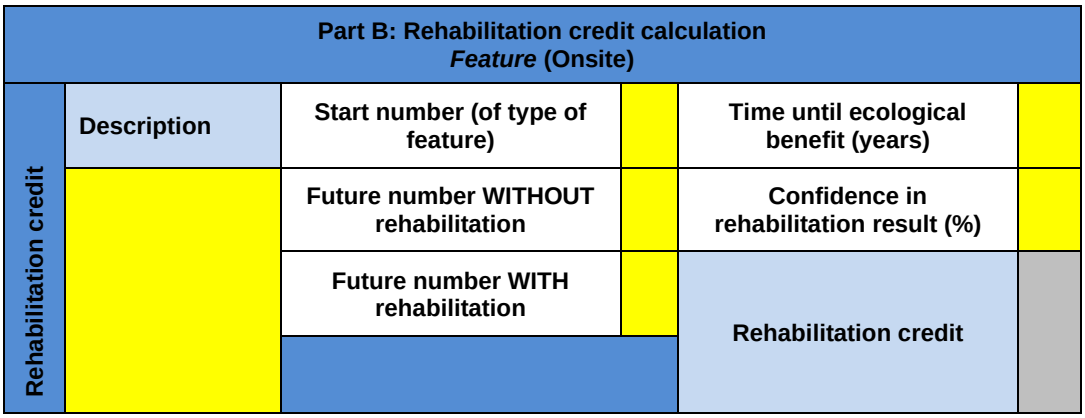

Figure 6: Rehabilitation credit calculation for feature

Description

The user must enter a brief description of the onsite rehabilitation taking place.

Number – start, future without rehabilitation and future with rehabilitation

The user must enter three scores: *start number*, *future number without rehabilitation*, and *future number with rehabilitation*. The *number* should be determined using the same *type of feature* as that used in step 1.

An improvement in the number of features of a site over time is a key means of achieving a conservation gain for the environmental value being impacted. Where completion criteria for proposed revegetation or rehabilitation are available during the assessment process, *future number with rehabilitation* must be consistent.

Start number

This should be considered as the number of the feature present at the revegetation site after the significant environmental impact has occurred. This score will be '0' where the site has been fully cleared by the project and no features remain. In some cases a project may only partially impact the environmental value so several features may be entered. For example, a number of important habitat trees may be retained.

Future number without rehabilitation

This should be considered as the number of the feature present at the site in the foreseeable future (20 years), after the project is complete and assuming that no rehabilitation was to occur. In many cases this will be the same as *current number*.

Future number with rehabilitation

This should be considered as the number of the feature present at the rehabilitation site in the foreseeable future (20 years), after the proposed onsite rehabilitation is complete. This must take into account the likely number at the time the rehabilitation activities finish. This should be considered at the same point in time as *future number without rehabilitation*.

This should relate to the number of features expected at the end of the rehabilitation, and not necessarily the number of features put in place at the start. For example, if an applicant plants 600 seedlings, but only expects 400 to remain at the end of rehabilitation, the user should enter 400.

Time until ecological benefit (years)

Time until ecological benefit relates to the estimated time difference between the impact and when the environmental benefit of the rehabilitation will be realised. The user must take into account when rehabilitation will begin; for example, the delay in commencement of rehabilitation until such time as the site is no longer required for the purpose for which it was impacted. This is also influenced by the time over which the rehabilitation can be expected to return an ecological benefit.

Time until ecological benefit is linked to *future number*, as this represents the time period by which the outcome will be achieved. *Time until ecological benefit* becomes particularly significant when growing trees for nesting hollows as it may take more than 100 years for a tree to form hollows.

See Appendix A for examples of how to estimate the *time until ecological benefit*.

Confidence in rehabilitation result (percentage)

The user must enter, as a percentage, the level of certainty that the proposed rehabilitation outcome will be achieved. This relates to the *future number* scores.

Confidence in rehabilitation result should take into account the strength and effectiveness of the proposed measures, the capacity of these measures to mitigate the risk of total loss of the site, and the ability of the proponent or applicant to achieve the predicted result. For example, a commitment to achieving 100 per cent of original species diversity through rehabilitation is likely to have a low confidence level due to variability in results. On the other hand, a commitment to achieving 50 per cent of original species diversity through rehabilitation is likely to have a high confidence level, as this has a higher likelihood of being achieved.

For rehabilitation, the *confidence in rehabilitation result* score must also consider the number of years over which the rehabilitation will be actively implemented and any risk to the long-term success after the proponent or applicant finishes. Where *time*

until ecological benefit is longer than the timeframe that the proponent or applicant will undertake the rehabilitation, the site's security of the site and long-term viability without further intervention must be considered. Where evidence of previous demonstrated success is provided, this will form the basis for the *confidence in rehabilitation result* score assigned.

See Appendix A for examples of how to estimate the *confidence in rehabilitation result*.

Rehabilitation credit

The user is not required to enter information for this field. The *rehabilitation credit* is automatically calculated based on the data entered.

Part C: Significant residual impact calculation

The user is not required to enter information for part C. The scores in part C are automatically calculated from the data entered into parts A and B, and do not require input by the user. The *significant residual impact* of a project is determined by deducting the *rehabilitation credit* (if applicable) from the *total quantum of impact.*

In the absence of a *rehabilitation credit*, the *significant residual impact* has the same score as the *total quantum of impact*. The *significant residual impact* score must be counterbalanced by the *offset value* (step 3).

Significant residual impact - area

When *area* is selected in step 1, the user sees the following screen (Figure 7).

Part C: Significant residual impact calculation *Area*		
Significant residual impact	**Total quantum of impact**	
	Rehabilitation credit	
	Significant residual impact	

Figure 7: Significant residual impact calculation for area

Significant residual impact - feature

When *feature* is selected in step 1, the user sees the following screen (Figure 8).

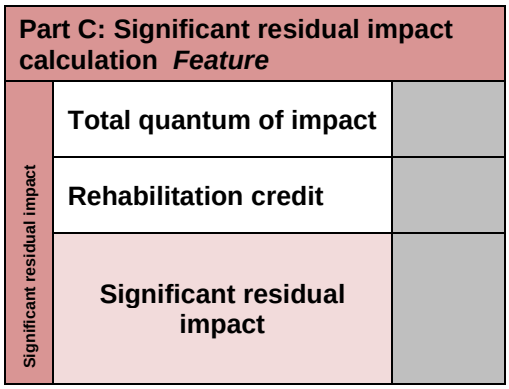

Figure 8: Significant residual impact calculation for feature

Note: Activating the 'clear data' macro (button at the top of step 2) will delete the content of the yellow cells.

2.3 Step 3: Calculating offsets

The offsets calculator has been developed for offsets to be achieved through land acquisition and/or on-ground management (including by financial contribution). To determine an appropriate quantum for offsets to be achieved through research projects, the user should liaise with the regulatory agency (note that research offsets do not apply to clearing permits under Part V Division 2 of the EP Act).

In some cases it may be considered appropriate to propose multiple offsets to address a single significant residual impact. Where this occurs, the resulting offsets calculations must have a minimum combined total of 100 per cent.

Land acquisition and on-ground management offsets

The *offsets calculation* allows the user to input values for land acquisition or on-ground management components to calculate the suitability in counterbalancing the significant residual impacts. Many of the fields are similar to those used in the *rehabilitation credit calculation* and should be applied in a consistent manner.

Important: Before submitting an offset proposal to the regulatory agency for review, a land acquisition offset that is proposed to be transferred to conservation management must be discussed with the proposed responsible vesting and management bodies to ensure the site is acceptable for transfer. Proposed land acquisitions should also include adequate funding for on-ground management.

Offsets calculation - area

When *area* is selected in step 1, the user sees the following screen (Figure 9).

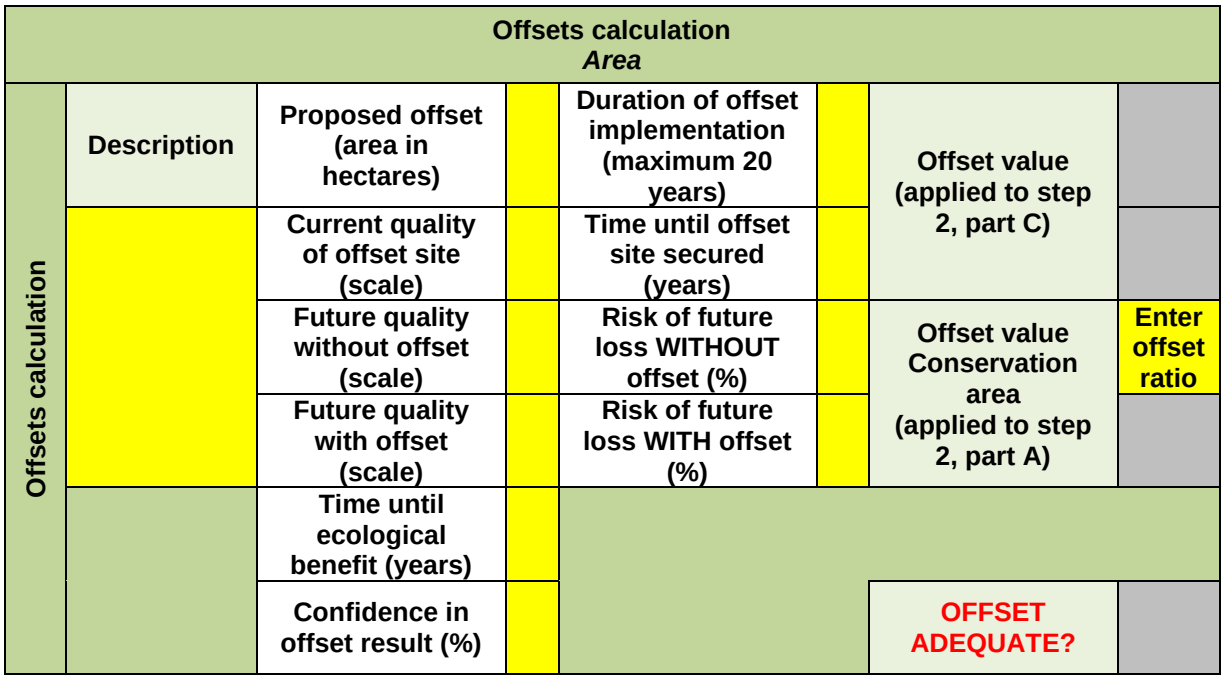

Figure 9: Offsets calculation for area

Description

The user must enter a brief description of the offset proposed.

Proposed offset (area in hectares)

The user must enter the area in hectares that will be subject to the offset.

Where a combination of land acquisition and on-ground management activities are proposed for one site, separate calculations should be undertaken for each type of offset (part C), with the resulting *offset value* scores adding up to a minimum of 100 per cent.

Where on-ground management varies across a site, separate calculations may need to be undertaken for each area. For example, a proposed offset involves the acquisition of 200 hectares of land. The user determines that the *current quality* is '5' across 150 hectares of the site, and '2' within the degraded portion. The *offset value* can be calculated separately for the two portions.

Quality (scale) - current, future without offset and future with offset

The user must enter three scores: *current quality of offset site*, *future quality without offset*, and *future quality with offset*. *Quality* scores must be determined using the same method as that used in steps 1 and 2. The determination of quality must take into consideration the factors of vegetation condition, site context, and habitat value. The calculator allows *quality* scores between 0 and 10 as relevant to the

environmental value identified in step 1, however it is expected that even if there is minimal existing native vegetation, the site would be selected to provide site context and habitat value.

An improvement in the quality of a site over time is a key means of achieving a conservation gain for the environmental value being impacted. Where completion criteria for proposed revegetation or rehabilitation are available during the assessment process, the *future quality with offset* score must be consistent. For example, if the completion criteria state that revegetation or rehabilitation will achieve a future quality of '5', the *future quality with offset* score must be the same.

Rehabilitation may aim to restore only those significant environmental values impacted, rather than all ecosystem values of a particular site. This limitation should be reflected in the *future quality* and *confidence in offset result*.

Appendix A has information on the various aspects that must be considered in determining a *quality* score.

Current quality

This should be considered as the current quality of the offset site.

For early offsets (those established before being attributed to an impact), this should be considered as the quality of the offset site at the time of entering into an early offset arrangement with the relevant agency.

Future quality without offset

This should be considered as the quality of the offset site in the foreseeable future (20 years), assuming that no offset was to occur.

Depending on the timeframe, the quality of a site may decline without the proposed offset being implemented. For a reduction in the *future quality* to be applied in the calculations, evidence is required of current degrading processes or threats to the site. For example, surveys over a number of years may indicate gradual decline in the quality of a site in the absence of management, or that adjacent development approvals will result in detrimental 'edge effects' to that site.

Future quality with offset

This should be considered as the quality of the offset site in the foreseeable future (20 years), after the offset is complete. This must take into account the likely quality at the time the offset activities finish. This should be considered at the same point of time as *future quality without offset*.

A *future quality with offset* score for revegetation/rehabilitation should be based on demonstrated success and/or scientific evidence; for example current best-practice techniques and positive research outcomes for those techniques for the vegetation type or feature being rehabilitated.

For offsets involving ceding of land to the crown, or conservation covenants in perpetuity, the *future quality with offset* score should be the likely quality in 20 years.

Time until ecological benefit (years)

Time until ecological benefit relates to the estimated time difference between the impact and when the environmental benefit of the offset will be realised. The user must take into account when rehabilitation will begin; for example, any delay in commencement of the offset such as time to acquire land.

Time until ecological benefit is linked to *future quality*, as this represents the time period by which the outcome will be achieved. *Time until ecological benefit* becomes particularly significant when growing trees for nesting hollows as it may take more than 100 years for a tree to form hollows.

For early offsets (those established before being attributed to an impact), this should be taken as the time of impact (not as the time of entering into an early offset arrangement with the relevant agency). Where the *time until ecological benefit* is 0, consult with the relevant agency before using the calculator.

See Appendix A for examples of how to estimate the *time until ecological benefit*.

Confidence in offset result (percentage)

The user must enter, as a percentage, the level of certainty that the proposed offset outcome will be achieved. This relates to the *future quality* score.

Confidence in offset result should take into account the strength and effectiveness of the proposed offset actions, the capacity of these actions to minimise the risk of total loss of the site, and the ability of the proponent or applicant to achieve the predicted result. For example, a commitment to achieving 100 per cent of original species diversity through rehabilitation is likely to have a low confidence level due to variability in results. On the other hand, a commitment to achieving 50 per cent of original species diversity through rehabilitation is likely to have a high confidence level, as this has a higher likelihood of being achieved.

For rehabilitation offsets, where evidence of previous demonstrated success is provided, this will form the basis for the *confidence in offset result* score assigned.

For early offsets (those offsets established before being attributed to an impact), *confidence in offset result* should be considered at the time of assessment, taking into account information up to that time (e.g. if the progress of the early offset has demonstrated a high success to date, a greater confidence score can be used).

See Appendix A for examples of how to estimate the *confidence in offset result*.

Duration of offset implementation (maximum 20 years)

Duration of offset implementation describes the estimated number of years over which an offset will be actively implemented. This score should represent the duration of the offset; for example, the duration specified in approval conditions, up to a maximum score of 20 years for sites protected in perpetuity.

The *duration of offset implementation* is linked to *risk of future loss* both with and without a proposed offset. Generally a higher score is applied where a longer duration of management or protection can be demonstrated.

For early offsets (those offsets established before being attributed to an impact), *duration of offset implementation* should be considered from the time of entering into an early offset arrangement with the relevant agency.

See Appendix A for examples of how to estimate the *duration of offset implementation*.

Time until offset site secured (years)

The user must enter the time between the impact and the time it is expected to take for the offset site to be secured.

Time until offset site secured is directly related to *risk of future loss* in that it represents the timeframe between the current risk of loss without the offset, and the reduced risk of loss expected to be achieved as a result of the offset being implemented.

The longer the time taken to reduce the risk of future loss, the greater the offset requirement will be.

For early offsets (those offsets established before being attributed to an impact) when the site has already been secured, a score of '0' should be entered.

Risk of future loss (percentage)

The *risk of future loss* is the estimated likelihood that the environmental values of a site will be completely lost in the foreseeable future.

The difference between the *risk of future loss* with a proposed offset and without the proposed offset indicates the level of averted loss provided by the proposed offset.

Appendix A has information on the various aspects that must be considered in determining a *risk of future loss* score.

Risk of future loss without offset

The user must enter, as a percentage, the likelihood that the environmental value on the offset site will be completely lost in the foreseeable future without an offset. The user should consider the duration for which the offset will be implemented in determining this score.

Risk of future loss with offset

The user must enter, as a percentage, the likelihood that the environmental value on the offset site will be completely lost in the foreseeable future with the offset in place. The user should consider the number of years over which the offset will be actively implemented in determining this score. For conservation covenants in perpetuity and land ceded to the crown, a 20-year timeframe should be considered.

Offset value

The user is not required to enter information for this field. The *offset value* is automatically calculated from the data entered.

For environmental values within the categories of species (flora/fauna), ecological community, wetland/watercourse and vegetation/habitat, the *offset value* fields relating to conservation area (including *offset ratio*) will be blanked out. Where the environmental value is a conservation area, only the *offset value* fields relating to conservation area (including *offset ratio*) will be visible.

Offset ratio

Where the environmental value is a conservation area, the offsets calculator will prompt the user to enter a multiplier (offset ratio). The user must enter the offset ratio determined by the regulatory agency for the type of conservation area being impacted. A minimum score of '1' must be entered, representing a 1:1 ratio, and is applied to the *significant impact* in step 2, part A. See Appendix A for examples of *offset ratios*.

Offset adequate?

The user is not required to enter information for this field. *Offset adequate?* is automatically calculated from the data entered, and informs the user whether the proposed offset counterbalances the *significant residual impact* calculated in step 2, part C and/or addresses the required *offset ratio*. Note: this field does not determine if the impact is acceptable or offset is suitable. It is the role of the decision-maker to determine if the offset counterbalances the significant residual impact.

The **What-if** button adjacent to the *offset value* score will become functional after the fields in steps 1, 2 and 3 have been completed. This can help the user identify the minimum offset by adjusting the *proposed offset (area in hectares)* score.

Offset calculation - feature

When *feature* is selected in step 1, the user sees the following screen (Figure 10).

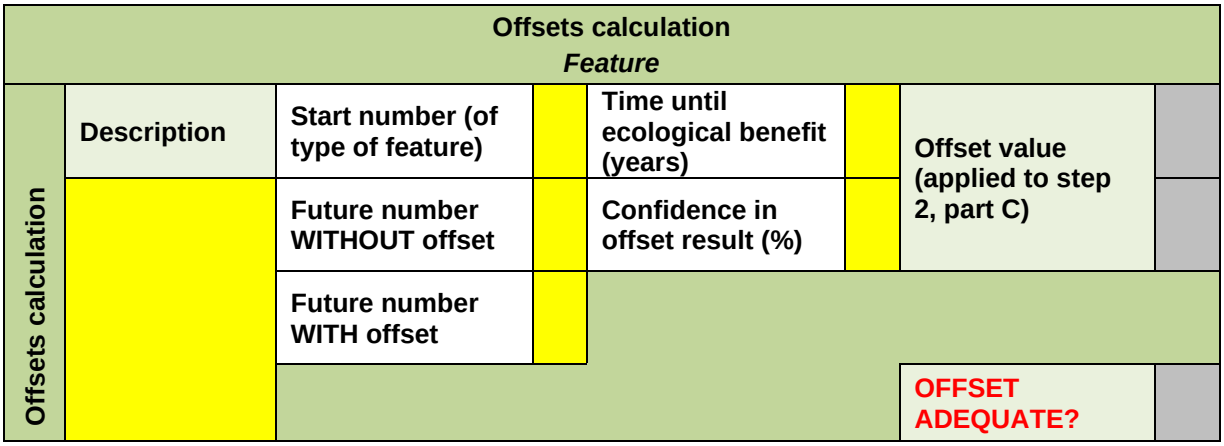

Figure 10: Offset calculation for feature

Description

The user must enter a brief description of the offset proposed.

Number – start, future without offset and future with offset

The user must enter three scores: *start number*, *future number without offset* and *future number with offset*. The *number* should be determined using the same *type of feature* as that used in steps 1 and 2.

An improvement in the number of features of a site over time is a key means of achieving a conservation gain for the environmental value that is being impacted. Where completion criteria for a proposed offset are available during the assessment process, the *future number with offset* must be consistent.

Start number

This should be considered as the number of the feature currently present at the site.

For early offsets (those offsets established before being attributed to an impact), this should be considered as the number of the feature present at the offset site at the time of entering into an early offset arrangement with the relevant agency.

Future number without offset

This should be considered as the number of the feature present at the offset site in the foreseeable future (20 years), assuming that no offset was to occur. Depending on the timeframe, the number of a type of feature present at a site may decline without the proposed offset being implemented. For a reduction in the *future number* to be applied in the calculations, evidence is required of current degrading processes or threats to the number of features. For example, surveys over several years may indicate gradual decline in the number of features on a site in the absence of management, or that adjacent development approvals will result in detrimental 'edge effects' to that site.

Future number with offset

This should be considered as the number of the feature present at the offset site in the foreseeable future (20 years), after the offset is complete. This must take into account the likely number at the time the offset activities finish. This should be considered at the same point of time as *future number without offset*.

This should relate to the number of features expected at the end of the offset, and not necessarily the number of features put in place at the start. For example, if an applicant plants 600 seedlings, but only expects 400 to remain at the end of the offset being managed, the user should enter 400.

Time until ecological benefit (years)

Time until ecological benefit relates to the estimated time difference between the impact and when the environmental benefit of the offset will be realised. The user must take into account when rehabilitation will begin; for example, any delay in commencement of the offset such as time to acquire land.

Time until ecological benefit is linked to *future number*, as this represents the time period by which the outcome will be achieved. *Time until ecological benefit* becomes

particularly significant when growing trees for nesting hollows as it may take more than 100 years for a tree to form hollows.

For early offsets (those offsets established before being attributed to an impact), this should be taken as the time of impact (not as the time of entering into an early offset arrangement with the relevant agency). Where the *time until ecological benefit* score is 0, consult with the relevant agency before using the calculator.

See Appendix A for examples of how to estimate the *time until ecological benefit*.

Confidence in offset result (percentage)

The user must enter, as a percentage, the level of certainty that the proposed offset outcome will be achieved. This relates to the *future number* score.

Confidence in offset result should take into account the strength and effectiveness of the proposed offset actions, the capacity of these actions to minimise the risk of total loss of the site, and the ability of the proponent or applicant to achieve the predicted result. For example, a commitment to achieving 100 per cent of original species diversity through rehabilitation is likely to have a low confidence level due to variability in results. On the other hand, a commitment to achieving 50 per cent of original species diversity through rehabilitation would have a higher likelihood of being achieved.

For rehabilitation offsets, where evidence of previous demonstrated success is provided, this will form the basis for the *confidence in offset result* score assigned.

For early offsets (those offsets established before being attributed to an impact), *confidence in offset result* should be considered at the time of assessment, taking into account information up to that time (e.g. if the progress of the early offset has demonstrated a high success to date, a greater confidence score can be used).

See Appendix A for examples of how to estimate the *confidence in offset result*.

Offset value

The user is not required to enter information for this field. The *offset value* is automatically calculated from the data entered.

Offset adequate?

The user is not required to enter information for this field. *Offset adequate?* is automatically calculated from the data entered, and informs the user whether the proposed offset counterbalances the *significant residual impact* calculated in step 2, part C and/or addresses the required *offset ratio*. Note: this field does not determine if the impact is acceptable or offset is suitable. It is the role of the decision-maker to determine if the offset counterbalances the significant residual impact.

The **What-if** button adjacent to the *offset value* score will become functional after the fields in steps 1, 2 and 3 have been completed. This can help the user identify the minimum offset by adjusting the *future number with offset* score.

Important: At the conclusion of each calculation, the spreadsheet should be saved to a new file name or printed to preserve the data entered.

Following this, activating the 'reinstate formula' macro (button adjacent to the *offset ratio* score in step 3) will re-set the default *offset ratio* score to enable the worksheet to be re-used, and activating the 'clear data' macros (buttons at the top of each worksheet) will delete the content of the yellow cells.

3 Abbreviations and definitions

The terms used in this guideline have the same meanings as given in existing sources, including:

- *Environmental Protection Act 1986* (sections 3 and 3A, and Schedule 5)
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*
- *Environmental Offsets Register* (Government of Western Australia 2013) www.offsetsregister.wa.gov.au/public/home.

The following abbreviations are used in this guideline:

Abbreviation	**Definition or term**
CAMBA	China-Australia Migratory Bird Agreement
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EP Act	WA *Environmental Protection Act 1986*
IUCN	International Union for Conservation of Nature
JAMBA	Japan-Australia Migratory Bird Agreement
Offsets calculator	*WA Environmental Offsets Calculator*
Offsets guidelines	*WA Environmental Offsets Guidelines* (Government of Western Australia, 2014)
RoKAMBA	Republic of Korea-Australia Migratory Bird Agreement

4 Additional resources

Department of Water and Environment Regulation: www.dwer.wa.gov.au

Department of Mines, Industry Regulation and Safety: www.dmirs.wa.gov.au

Environmental Protection Authority: www.epa.wa.gov.au

Further reading

Australian Government, *Australia's bioregions – maps*.

Department of Biodiversity, Conservation and Attractions, FloraBase.

Department of Environment and Conservation 2014, *A guide to the assessment of applications to clear native vegetation,* Department of Environment and Conservation, Perth.

Department of Water and Environmental Regulation 2018, *A guide to preparing revegetation plans for clearing permits,* Department of Water and Environmental Regulation, Perth.

Department of Environment Regulation 2014, *Clearing of native vegetation offsets procedure,* Department of Environment Regulation, Perth.

Department of Natural Resources and Environment 2002, *Victoria's native vegetation management – a framework for action,* Government of Victoria.

Department of Sustainability, Environment, Water, Population and Communities 2012. *How to use the Offsets Assessment Guide*, October 2012, Australian Government, Canberra.

Environmental Protection Authority 2016, *Technical guidance: Terrestrial fauna surveys*, EPA, Western Australia.

Gibson N et al. 1994, *A floristic survey of the southern Swan coastal plain,* Perth: Department of Conservation and Land Management and the WA Conservation Council for the Australian Heritage Commission.

Government of Western Australia 2000, *Bush Forever volume 1* (Western Australian Planning Commission) and *Bush Forever volume 2* (Department of Environmental Protection), Perth, Western Australia.

Government of Western Australia 2011, *WA Environmental Offsets Policy*, September 2011, Government of Western Australia.

Government of Western Australia 2014, *WA Environmental Offsets Guidelines*, August 2014, Government of Western Australia.

Hussey BMJ & Wallace KJ 1993, *Managing your bushland*, Department of Conservation and Land Management, Western Australia.

Hussey BMJ, Keighery GJ, Dodd J, Lloyd SG & Cousens RD 2007, *Western weeds: A guide to the weeds of Western Australia,* 2nd edition, The Plant Protection Society of Western Australia, Victoria Park.

Markey A 1997, *A floristic survey of the northern Darling Scarp,* prepared for the Department of Conservation and Land Management and the Western Australian Conservation Council for the Australian Heritage Commission, Perth.

Natural Resource Policies and Program Committee 2009, *Australia's strategy for the national reserve system 2009–2030*, Government of Australia.

Western Australian Planning Commission 2010, *State Planning Policy 2.8: Bushland policy for the Perth metropolitan region*, Government of Western Australia.

Appendix A: Additional information for determining scores

Conservation significance score[3]

For environmental values within the categories of species (flora/fauna) and ecological community, the *conservation significance score* is calculated as the sum of the likelihood of extinction (related to the level of threat for a particular species or ecological community, if applicable) and the probability of catastrophe.

The annual probability of extinction is an estimate of the average chance that a species or ecological community will be completely lost in the wild each year, given recent rates of decline. The annual probability of extinction is incorporated into the impact and offset calculation process as a discounting factor for aligning activities that occur at different points in time. This score is derived from the IUCN Red List for threatened species, as shown in Table A1.

Table A1: Calculation of discounting factor for environmental value (IUCN ranking)

IUCN conservation status for environmental value with level of threat	**IUCN criteria for probability of extinction in the wild**	**Annual probability of extinction (geometric mean)**	**Probability of catastrophe**	**Discounting factor**
Critically endangered	At least 50% in 10 years	6.7%	0.1%	**6.8%**
Endangered	At least 20% in 20 years	1.1%	0.1%	**1.2%**
Vulnerable	At least 10% in 100 years	0.1%	0.1%	**0.2%**

Where there is peer-reviewed scientific evidence that a species or ecological community has a different annual probability of extinction to that of its IUCN criteria, then that alternative score may be used.

Where there is a large time lag between an impact occurring and an offset delivering a conservation gain, there is a greater risk that a threatened species or ecological community will be completely lost in the wild. This risk will also be greater for species or ecological communities with higher annual probabilities of extinction; for example, a critically endangered species.

Table A2 outlines the *conservation significance scores* (discounting factors) that are applied to the calculations for environmental values within the categories of species (flora/fauna), ecological community, wetland/watercourse and vegetation/habitat.

[3] Adapted from Government of Australia 2012, *How to use the Offsets Assessment Guide*, October 2012, Government of Australia.

Table A2 also has examples of environmental values within the category of 'conservation area', for which a *conservation significance score* is not applicable and a multiplier (offset ratio) set by the regulatory agency may be appropriate.

Table A2: Conservation significance scores for environmental values

Environmental value	**Conservation significance score**
Species (flora/fauna)	
• A rare flora/threatened species currently ranked as '**critically endangered**', including impacts to buffers/habitat or other areas necessary to maintain that species or which are likely to result in a species being listed as 'critically endangered'.	**6.8%**
• A rare flora/threatened species currently ranked as '**endangered**', including impacts to buffers/habitat or other areas necessary to maintain that species or which are likely to result in a species being listed as 'endangered'.	**1.2%**
• A rare flora/threatened species currently ranked as '**vulnerable**', including impacts to buffers/habitat or other areas necessary to maintain that species or which are likely to result in a species being listed as 'vulnerable'.	**0.2%**
• A flora or fauna species currently ranked as '**priority**', including impacts to buffers/habitat or other areas necessary to maintain that species.	**0.1%**
• Any other flora or fauna species, or impacts to buffers/habitat or other areas necessary to maintain that species, for which an offset is required, including: o a fauna species currently ranked as 'conservation dependent' o other specially protected fauna o a flora or fauna species at the extent of its current known range.	**0.1%**
• Any flora or fauna species for which another annual probability of extinction is stated in peer-reviewed published literature.	**[manual entry]**
Ecological community	
• A threatened ecological community currently ranked as '**critically endangered**', including impacts to buffers/habitat or other areas necessary to maintain that threatened ecological community or which are likely to result in a threatened ecological community being listed as 'critically endangered'.	**6.8%**
• A threatened ecological community currently ranked as '**endangered**', including impacts to buffers/habitat or other areas necessary to maintain that threatened ecological community or which are likely to result in a threatened ecological community being listed as 'endangered'.	**1.2%**
• A threatened ecological community currently ranked as '**vulnerable**', including impacts to buffers/habitat or other areas necessary to maintain that threatened ecological community or which are likely to result in a threatened ecological community being listed as 'vulnerable'.	**0.2%**
• An ecological community currently ranked as '**priority**', including impacts to buffers/habitat or other areas necessary to maintain that ecological community.	**0.1%**
• Any ecological community for which another annual probability of extinction is stated in peer-reviewed published literature.	**[manual entry]**
Wetland/watercourse	
• Vegetation associated with a wetland or watercourse for which an offset is required.	**0.1%**
• A category or type of wetland or watercourse for which an offset is required.	**0.1%**

Environmental value	Conservation significance score
• Any vegetation associated with a wetland or watercourse, or any category or type of wetland or watercourse, for which another annual probability of extinction is stated in peer-reviewed published literature.	**[manual entry]**
Vegetation/habitat	
• A terrestrial native vegetation complex that has 30 per cent or less[4] of its pre-European extent remaining in the bioregion[5], or is likely to result in a native vegetation complex having 30 per cent or less representation in the bioregion.	**0.1%**
• A terrestrial native vegetation complex in a constrained area (e.g. urban development in cities and major towns)[6] on the Swan coastal plain that has 10 per cent or less of its pre-European extent remaining, or is likely to result in a native vegetation complex having 10 per cent or less representation on the Swan coastal plain.	**0.1%**
• Habitat-supporting migratory species, including those listed under the following: o Japan-Australia Migratory Bird Agreement o China-Australia Migratory Bird Agreement o Republic of Korea-Australia Migratory Bird Agreement.	**0.1%**
• Vegetation or habitat that is representative of high biodiversity, and/or has a higher diversity than other examples of the same vegetation or habitat in the bioregion (including vegetation in 'degraded' condition that is in better condition than other examples of the same vegetation in the local area).	**0.1%**
• Vegetation or habitat that is otherwise rare, restricted or unique.	
Conservation area	
• Crown reserve managed under the *Conservation and Land Management Act 1984* and/or the *Land Administration Act 1997* for the purpose of conservation, including: o National Park o Nature Reserve o Marine Park o Marine Nature Reserve o *Conservation and Land Management Act 1984* section 5(1)(g) or 5(1)(h) reserve o Conservation Park o State Forest o Timber Reserve o Regional Park o Marine Management Area.	**Not applicable** **[an offset ratio may apply]**
• Conservation covenant, including those registered under one of the following: o *Biodiversity Conservation Act 2016* o *Environmental Protection Act 1986* o *Soil and Land Conservation Act 1945* o *National Trust of Australia (WA) Act 1964*	

[4] *National objectives and targets for biodiversity conservation 2001–2005*

[5] Interim Biogeographic Regionalisation of Australia

[6] For example, *Bush Forever* (2000), Greater Bunbury Region Scheme, Peel Region Scheme (see the Department of Planning, Lands and Heritage website for further information).

Environmental value	Conservation significance score
○ *Transfer of Land Act 1893*. • Bush Forever site, within the meaning of *Bush Forever* (2000)[7] and *State Planning Policy 2.8 Bushland policy for the Perth metropolitan region (2010)*. • Any other conservation area for which an offset is required.	

Quality[8]

Quality is a measure of how well a particular site supports a particular environmental value (i.e. the ecological requirements of the environmental value), and contributes to its ongoing viability.

The determination of quality must include evaluation of the key ecological attributes of the environmental value. These attributes may include:

- habitat requirements and variability: nesting, breeding, foraging, dispersal, migration and/or roosting requirements of a species; ecological components and occurrence states for an ecological community, wetland/watercourse, vegetation/habitat; habitat values of a conservation area
- lifecycle and population dynamics: key life cycle stages of a species or ecological community, and how these impact its population viability or ecosystem integrity
- movement and distribution patterns: how a species population or ecological community functions across the landscape/seascape
- threatening processes: those processes contributing to the loss of a species, ecological community, wetland/watercourse, vegetation/habitat or conservation area
- wetlands/watercourses: biological condition, pests and diseases, chemical condition (e.g. water quality and acid sulfate soils), and physical condition (e.g. soil, geology and landform).

The determination of quality must take into consideration the factors of vegetation condition, site context, and habitat value. The weighting given to each factor depends on the ecological requirements of the impacted environmental value (e.g. the condition of the vegetation at a site may be of greater importance to the survival of a particular species than the site's position in the landscape).

[7] Government of Western Australia 2000, *Bush Forever volume 1* (Western Australian Planning Commission) and *Bush Forever volume 2* (Department of Environmental Protection), Perth, Western Australia.

[8] Adapted from:

- Government of Australia 2012, *How to use the Offsets Assessment Guide*, October 2012, Government of Australia.
- Casson N, Downes S **&** Harris A 2009, *Native vegetation condition assessment and monitoring manual for Western Australia*, report prepared for the Native Vegetation Integrity Project, Department of Environment and Conservation, Perth, Western Australia.

Vegetation condition

Vegetation condition is the condition of the native vegetation present at a site in which the specified environmental value occurs. The evaluation of vegetation condition should include (but not be limited to) consideration of the following:

- forms of disturbance and/or threats: disturbance from land use and management practices, edge effects
- number of weeds: disturbance opportunistic, those carried by vectors, persistent perennials, aggressive invaders in the absence of disturbance
- soil stability: the presence of stems and other plant bases, surface feeder roots, humus/organic matter, duricrust, cryptograms, lichens, litter and debris
- number of native plants: species composition of a particular vegetation type, and a sense of whether there has been a loss of components
- number of strata: vegetation structure of a particular vegetation type, and a sense of whether there has been a loss of components
- seedlings and sapling presence: regenerative capacity, for resilience
- vegetation health: general health of the overstorey and understorey, signs of stress, atypical leaf colouration, leaf/limb or whole plant death.

It may be appropriate for the condition of vegetation to be determined using the Keighery scale[9] in the intensive land use zone and the Trudgen scale[10] in the extensive land use zone.

Site context

Site context is the relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of the particular environmental value. The evaluation of site context should include (but not be limited to) consideration of the following:

- movement patterns of the specified environmental value; that is, where the specified environmental value is a mobile species
- proximity of the site in relation to other areas of suitable habitat for the specified environmental value, such as size of the site in the context of the surrounding landscape/region, connectivity with other suitable/known habitat for the specified environmental value, proximity to water
- importance of the site in relation to the overall species population or the occurrence of a particular ecological community

[9] Keighery BJ 1994, *Bushland plant survey – A guide to plant community survey for the community*, Wildflower Society of WA (Inc.), Nedlands, Western Australia.

[10] Trudgen ME 1991, *Vegetation Condition Scale*. In: National Trust (WA) 1993 *Urban Bushland Policy*, National Trust of Australia (WA), Wildflower Society of WA (Inc.) and the Tree Society (Inc.), Perth, WA.

- vegetation extent, such as extent of vegetation type within the bioregion, percentage of vegetation coverage within the local area
- the occurrence of threats on or near the site.

Habitat value

Habitat value refers to the ability of a site to support the specified environmental value. The determination of habitat value should consider whether a particular site may have a high importance for the environmental value, despite, for example, appearing to have low-scoring vegetation condition. The evaluation of habitat value should include (but not be limited to) consideration of the following:

- the presence of a species or ecological community on the site (confirmed/modelled through survey data)
- the density of a species or the number of occurrences of an ecological community at the site
- the context of a species population or ecological community at the site in regard to the overall species population of ecological community extent
- any threats present at the site that may impact the survival of species or ecological community.

Time until ecological benefit

Table A3 has some examples of ecological benefit time considerations in relation to specific environmental values.

Table A3: Examples of ecological benefit time considerations

Environmental value	Impact	Time until ecological benefit (estimated) and/or factors for consideration
Threatened ecological community SCP20b *Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan coastal plain	Fire / burning	Component taxa *Petrophile macrostachya* is a serotinous species that is killed by fire and only reproduces from seed. The juvenile period is 60 months, therefore a minimum inter-fire interval of 10 years and up to 20 years would be recommended for occurrences that contain this species.[11] The draft management plan for reserves in the City of Armadale recommends 'No fire regime, history of fire interval, season, intensity or patchiness is optimal for all species. However, for Swan coastal plain urban bushland areas, it is recommended that planned burns should not be conducted more regularly than at least 12 to 15 years'.[12]

[11] Department of Environment and Conservation 2012, *Banksia attenuata and/or Eucalyptus marginata woodlands of the eastern side of the Swan coastal plain (Swan coastal plain community type 20b – Gibson et al. 1994), Interim recovery plan 2012–2017*, October 2012, Government of Western Australia.

[12] City of Armadale 2010, *Draft bushland management plan for reserves in the City of Armadale*, City of Armadale.

Environmental value	Impact	Time until ecological benefit (estimated) and/or factors for consideration
Carnaby's black cockatoo	Loss of foraging habitat	Observed feeding on a range of foods including seeds of *Banksia*, *Hakea*, *Eucalyptus*, *Corymbia*, *Grevillea*, *Mesomelaena*, *Pinus* and *Allocasuarina* spp.; flowers of some *Banksia* (formerly *Dryandra*) spp., *Banksia grandis*, *Eucalyptus*, *Corymbia*, *Grevillea* and *Callistemon* spp.; fruiting nut trees, apples, soft fruits, plane trees, liquidambar, *Erodium* spp. (corkscrew/storksbill/wild geranium) seeds and wild radish (*Raphanus raphanistrum*); and insect larvae extracted from trees.[13] Ongoing research suggests that feeding habitat can be restored within seven years. At Boddington Gold Mine in the eastern jarrah forest, Carnaby's cockatoos feed intensively on regenerating native vegetation in mine-site rehabilitation areas as early as six years after planting.[14]
	Loss of breeding habitat	Nest in the hollows of live or dead eucalypts, primarily the smooth-barked salmon gum and wandoo. Studies have reported that it takes 100–200 years for trees to develop suitable hollows.[15]
Baudin's black cockatoo and forest red-tailed black cockatoo	Loss of foraging habitat	Jarrah (mature): about 24–27 months from budding to seed shed; individual trees may only flower every four to six years.[16] Marri (mature): about 17 months from budding to seed shed; individual trees may take up to three years to recover from a large flowering effort.[14]
	Loss of breeding habitat	Nest in tree hollows 30–40 centimetres in diameter and >30 centimetres deep. Analyses have shown that trees with sufficiently large hollows may be between 200 and 500 years of age.[14]
Western ringtail possum	Loss of habitat (nesting and foraging)	Feed mainly on leaves with occasional flowers, fruit and buds. Coastal populations occupy peppermint (*Agonis flexuosa*) dominated sites, and inland populations currently occupy jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) dominated forests in the upper Warren region.[17]

[13] Johnstone R, Kirkby T, Stone P & Minton C 2003, *White-tailed black-cockatoos: Identification challenges and changes in distribution and status, and links with a community program – Cockatoo Care*. In: *Conserving Carnaby's Black-Cockatoo: Future Directions – proceedings from a conservation symposium*, Perth, Western Australia.

[14] References cited in: Finn H, Stock W & Valentine L 2009, *Pines and the ecology of Carnaby's black cockatoos (Calyptorhynchus latirostris) in the Gnangara Sustainability Strategy area*, July 2009, Edith Cowan University, Murdoch University and Department of Environment Conservation, Western Australia.

[15] References cited in: Department of Parks and Wildlife 2013, *Carnaby's cockatoo (Calyptorhynchus latirostris) recovery plan*, October 2013, Government of Western Australia and Commonwealth Government.

[16] References cited in: Department of Environment and Conservation 2008, *Forest black cockatoo (Baudin's cockatoo Calyptorhynchus baudinii and forest red-tailed black cockatoo Calyptorhynchus banksii naso) recovery plan*, May 2008, Government of Western Australia and Commonwealth Government.

[17] Shedley E & Williams K 2014, *An assessment of habitat for western ringtail possum (Pseudocheirus occidentalis) on the southern Swan coastal plain (Binningup to Dunsborough)*, Department of Parks and Wildlife, Government of Western Australia.

Environmental value	Impact	Time until ecological benefit (estimated) and/or factors for consideration
		Preference for larger diameter (0.8–1.1 m diameter at breast height) peppermint trees where these were used for resting and foraging.[15]
Wandoo woodland	Disturbance (including by grazing)	Replanted trees may take 50 years to achieve 200 mm diameter at breast height.[18]

Examples

Example 1: After clearing a site, an applicant intends to extract sand for a period of approximately 10 years, followed by rehabilitation of the site to a vegetation type similar to that which was cleared (taking into account the modified soil profile). The applicant expects that rehabilitation will be established/reach maturity after 20 years. The time until ecological benefit is [10+20=] 30 years.

Example 2: After clearing a site, an applicant intends to extract sand for a period of approximately 10 years. The impact will occur in stages, with each stage open for 12 months. Progressive rehabilitation to a vegetation type similar to that which was cleared (taking into account the modified soil profile) will be undertaken for each stage. The applicant expects that rehabilitation will be established/reach maturity after 20 years. In this example the time until ecological benefit is [1+20=] 21 years for each stage, and a single overall offsets calculation may be applied based on this consistent score.

Confidence in rehabilitation/offset result

Confidence in the rehabilitation or offset results is the level of certainty that the proposed outcome will be achieved. Confidence in rehabilitation result should take into account the strength and effectiveness of the proposed measures, the capacity of these measures to mitigate the risk of total loss of the site, and the ability of the proponent or applicant to achieve the predicted result.

The following aspects should be considered in determining the *confidence in rehabilitation result* and *confidence in offset result* scores where rehabilitation is proposed:

- the type of vegetation/feature being rehabilitated
- the operator's experience in undertaking rehabilitation of this nature
- the availability of evidence that the environmental value can be rehabilitated, including demonstrated success

[18] Hussey BMJ 1999, *How to manage your wandoo woodlands*, Department of Conservation and Land Management, Western Australia.

- the likely timeframe over which the environmental value could successfully be rehabilitated, and the likely lag time before the impact is addressed
- how the environmental value being rehabilitated will be defined and measured.

Examples

Example 1 (rehabilitation): An applicant proposes to clear an area for a temporary access track, and to rehabilitate the area once the track is no longer required after two years. The applicant has some experience in successful rehabilitation, having undertaken rehabilitation on similar vegetation on their property previously. There are also rehabilitation methods known for the vegetation type. The rehabilitation will be undertaken in accordance with an approved revegetation plan with the *future quality* changing from '1' to '5'. In this case, the applicant indicates they are 80 per cent confident of achieving this result.

Example 2 (rehabilitation): A proponent proposes to rehabilitate an impact site through the direct planting of seedlings. Direct planting generally has a higher success rate compared with direct seeding and is likely to result in on-ground improvement in quality sooner. As such, assuming all other variables are consistent (e.g. timeframes, level of monitoring, commitment to maintain), the *confidence in rehabilitation result* score for direct planting should be higher than for direct seeding. The *confidence in rehabilitation result* score for direct seeding could be increased if the proponent commits to a longer timeframe over which to implement (and supplement as necessary) the rehabilitation until it achieves the predicted result.

Example 3 (offset): Company A decides to rehabilitate two highly cleared and adjacent vegetation types (1 and 2), each of which currently has a quality score of '1'. The company has previous experience in successfully rehabilitating vegetation type 1, and is 90 per cent confident it can achieve a rehabilitation result with an overall quality score of '5' for that vegetation type. However the company has limited experience in rehabilitating vegetation type 2 and is 50 per cent confident that it can achieve an overall quality score of '5' for that type, but is 90 per cent confident that it can achieve a quality score of '3'.

Duration of offset implementation

Examples

Example 1: A proponent intends to undertake an offset involving replanting. The proponent has prepared a revegetation plan for this offset which states that the site will be revegetated over a period of three years, and monitored for a further five years with supplementary planting if required. The duration of offset implementation for this project is considered to be (3+5=) 8 years.

Risk of future loss

Risk of future loss relates to anthropogenic events, and needs to consider development intent, tenure and surrounding land use pressures. Risk categories

should be applied with regard to the likelihood and consequence of events occurring, such as development under the current land use zoning, and whether it would result in the site no longer having benefit for the environmental value over the foreseeable future. The *risk of future loss* is linked to *time until ecological benefit* to the effect that the longer the duration of an impact, the higher the risk of loss.

Estimation of the *risk of future loss* should take into account (but not be limited to) the following factors:

- the presence and strength of formal protection mechanisms currently in place at the site, such as zoning, conservation covenants, clearing legislation
- the presence of pending development applications, mining leases or other instruments relating to the site, indicating development potential
- the average *risk of future loss* for similar sites
- the applicable risk factors, such as the likelihood that development would occur under the current land use zoning, and whether it would it result in the site no longer holding any importance for the environmental value being offset over the foreseeable future
- the capacity to protect the environmental value through planning approvals and environmental assessment processes
- the potential for partial or complete failure of the rehabilitation to achieve the predicted result as a result of modified soil profiles, climatic events etc.

Estimation of the *risk of future loss* on crown land in the extensive land use zone should take into account (but not be limited to) the following factors:

- the presence and strength of formal protection mechanisms currently in place at the site (e.g. clearing legislation)
- the presence of pending or granted exploration and mining leases, granted environmental approvals, or other instruments relating to the site, indicating development potential
- the average *risk of future loss* for similar sites
- the applicable risk factors; for example, the likelihood that development would occur under the current land use, and whether it would it result in the site no longer holding any importance for the environmental value being offset over the foreseeable future – this could include areas subject to State Agreement Acts, pastoral leases or diversification permits
- the potential for partial or complete failure of the rehabilitation to achieve the predicted result as a result of modified soil profiles, climatic events etc.

Risk of future loss with an offset will generally have the same or lower score than without an offset, however there are some exceptions to this when revegetating a bare area. For example, a bare area would have a 0 per cent *risk of future loss without offset* given there are no in situ biodiversity values, but the *risk of future loss with offset* may be higher if there is a risk the site may be developed in future (once the revegetation is established).

Examples

Example 1: A company will undertake an offset which involves the ceding of land to the crown for conservation purposes, along with on-ground management. The offset site is currently vegetated, zoned urban deferred, and has no existing environmental approvals. Over the next 20 years, there is a moderate likelihood the environmental value will be lost. The *risk of future loss without offset* is estimated to be 30 per cent. As the intention is for the offset site to be placed into conservation reserve, the *risk of future loss with offset* is reduced to 5 per cent.

Example 2: An individual will undertake an on-ground rehabilitation offset under a conservation covenant. The offset site is currently semi-vegetated, zoned rural, and has no existing clearing approvals. Over the next 20 years, there is a low likelihood that the environmental value will be lost. The *risk of future loss without offset* is estimated to be 20 per cent. The conservation covenant will be placed on the land in perpetuity and registered on title. While this reduces the likelihood of loss in the future, it is not as secure as a conservation reserve. Therefore, the *risk of future loss with offset* is reduced to 10 per cent.

Example 3: A proponent has identified a site to be acquired for a threatened ecological community. The site is currently zoned urban and is located in an area that is already mostly developed for residential purposes. There is no current clearing permit for the site, however the landholder has subdivision approval for the land. Given the high risk the site will be developed in the foreseeable future, the *risk of future loss without offset* is estimated to be 80 per cent.

Offset ratio

Examples

Example: An applicant wants to construct an access track and proposes to clear in an area of State Forest that is managed for conservation purposes. During the regulatory agency's assessment of the application, the applicant receives approval from the managing authority of the State Forest to access to the land for the purpose of the proposed clearing, subject to a 1:1 offset ratio calculated for the *quality* of the area impacted. In this case the user must manually identify an offset that will meet the managing authority's requirement, as the offsets calculator is limited to considering offset ratios for the *significant impact* identified in part A of step 1.

Appendix B: Case studies

EP Act Part V clearing provisions

Example 1: Two overlapping environmental values, rehabilitation credit, one type of offset

An applicant receives approval to clear 8.2 hectares of native vegetation in 'excellent' to 'degraded' condition that comprises habitat for Carnaby's cockatoo (ranked as 'endangered'), including a small area of threatened ecological community type 3a (ranked as 'critically endangered').

The activity is expected to take five years to finish and the applicant proposes to revegetate the entire site once the purpose for which the clearing is required is completed.

The regulatory agency's assessment identifies that the proposal is environmentally acceptable, and that an offset is required to address the significant residual impacts.

As an offset, the applicant proposes to provide funds to the Department of Biodiversity, Conservation and Attraction (DBCA) for the purchase of 25 hectares of rural-zoned native vegetation for transfer to conservation tenure. A survey of the proposed acquisition area shows it contains both the environmental values that need to be offset – Carnaby's cockatoo foraging habitat and threatened ecological community type 3a – and describes the current quality. The applicant also agrees to fund fencing and weed control once the lot has been acquired.

In using the offsets calculator, *area* is considered to be appropriate to the environmental value impacted in this instance.

Two calculations are required: one for each of the environmental values identified.

Step 1: Determining conservation significance

Calculation 1: Carnaby's cockatoo

Calculation/element	Score	Rationale
Conservation significance		
Description	Carnaby's cockatoo	The proposed clearing will impact on foraging habitat for Carnaby's cockatoo.
Type of environmental value	Species (flora/fauna)	Drop-down list
Conservation significance of environmental value	Rare/threatened species – endangered	Drop-down list

Calculation 2: Threatened ecological community

Calculation/element	Score	Rationale
Conservation significance		
Description	Threatened ecological community type 3a	The proposed clearing will impact on 1 hectare of threatened ecological community type 3a.
Type of environmental value	Threatened ecological community	Drop-down list
Conservation significance of environmental value	Threatened ecological community – critically endangered	Drop-down list

From this information, the *conservation significance score* is automatically generated as:

- Carnaby's cockatoo: **1.2 per cent**
- Threatened ecological community: **6.8 per cent**

Step 2: Calculating significant residual impact

Part A: Significant impact calculation

Calculation 1: Carnaby's cockatoo

Calculation/element	Score	Rationale
Significant impact		
Description	8.2 hectares of Carnaby's cockatoo habitat	Clearing of 8.2 hectares of native vegetation in 'excellent' to 'degraded' condition that includes habitat for Carnaby's cockatoo.
Significant impact (hectares)	8.2	See above

Calculation 2: Threatened ecological community

Calculation/element	Score	Rationale
Significant impact		
Description	1 hectare of threatened ecological community type 3a	Clearing of 1 hectare of threatened ecological community type 3a.
Significant impact (hectares)	1	See above

Calculation/element	Score	Rationale
Quality (score)	6	Based on the vegetation condition obtained from flora surveys of the application area and the value of the site to the species.

Calculation/element	Score	Rationale
Quality (score)	4	Based on the vegetation condition obtained from flora surveys of the application area and the value of the site to the community.

From this information, the *total quantum of impact* is calculated as:

- Carnaby's cockatoo: **4.92**
- Threatened ecological community: **0.40**

Part B: Rehabilitation credit calculation

Calculation 1: Carnaby's cockatoo

Calculation/element	Score	Rationale
Rehabilitation credit		
Description	Revegetation of cleared area	Revegetation of cleared area
Proposed rehabilitation (area in hectares)	8.2	A rehabilitation credit has been calculated only for Carnaby's cockatoo.
Current quality of rehabilitation site (scale)	0	As the site will be completely cleared and the site does not provide any connectivity to existing native vegetation or habitat value, start quality is 0.
Future quality WITHOUT rehabilitation (scale)	1	It is considered that a small amount of natural regeneration is likely to occur within the site over the next 20 years, even without rehabilitation.

Calculation 2: Threatened ecological community

Calculation/element	Score	Rationale
Rehabilitation credit		
Description		None proposed – the proposed rehabilitation will not benefit threatened ecological community type 3a and is therefore not considered for that calculation.
Proposed rehabilitation (area in hectares)		
Current quality of rehabilitation site (scale)		
Future quality WITHOUT rehabilitation (scale)		

Calculation/element	Score	Rationale
Future quality WITH rehabilitation (scale)	4	Implementation of an adequate revegetation plan with monitoring and management is expected to result in a site quality of 4 within 15 years (as relevant to Carnaby's cockatoo foraging habitat establishment).
Time until ecological benefit (years)	15	It is anticipated the site will be used for five years and then revegetation will begin. There is likely to be a time lag of 10 years for establishment of Carnaby's cockatoo foraging habitat. The time between clearing the site and the ecological benefit is therefore a total of 15 years.
Confidence in rehabilitation result (%)	80	An adequate revegetation plan with ongoing management has been submitted to DWER.

Calculation/element	Score	Rationale
Future quality WITH rehabilitation (scale)		
Time until ecological benefit (years)		
Confidence in rehabilitation result (%)		

From this information, the *rehabilitation credit* is calculated as:

- Carnaby's cockatoo: **1.65**
- Threatened ecological community: **0.00**

Part C: Significant residual impact calculation

From the *total quantum of impact* carried forward from part A and the *rehabilitation credit* carried forward from part B, the *significant residual impact* is calculated as:

- Carnaby's cockatoo: **3.27**
- Threatened ecological community: **0.40**

Step 3: Calculating offsets

Calculation 1: Carnaby's cockatoo

Calculation/element	Score	Rationale
Offsets		
Description	Land acquisition	A single offset involving the provision of funds to DBCA for purchase of 25 hectares is proposed to address the significant residual impacts to both environmental values. The proposed offset site includes 25 hectares of Carnaby's cockatoo foraging habitat.
Proposed offset (area in hectares)	25	Of the total extent of the proposed offset, 25 hectares is relevant to the impact to Carnaby's cockatoo.
Current quality of offset site (scale)	7	Vegetation within the offset site has been assessed as being of high quality for both environmental values.
Future quality WITHOUT offset (scale)	7	The quality of the habitat would not be expected to change in the absence of the offset.
Future quality WITH offset (scale)	8	On-ground management includes fencing to prevent grazing pressure and weed control. The quality of the habitat is likely to improve slightly as a result of the offset as there will be more recruitment of feeding habitat species.

Calculation 2: Threatened ecological community

Calculation/element	Score	Rationale
Offsets		
Description	Land acquisition	As for calculation 1 The proposed offset site includes approximately 3 hectares of threatened ecological community type 3a.
Proposed offset (area in hectares)	3	Of the total extent of the proposed offset, 3 hectares is relevant to the impact to threatened ecological community type 3a.
Current quality of offset site (scale)	7	As for calculation 1
Future quality WITHOUT offset (scale)	7	As for calculation 1
Future quality WITH offset (scale)	8	As for calculation 1

Calculation/element	Score	Rationale
Time until ecological benefit (years)	1	It is expected that the purchase of the land will occur within 12 months of the clearing. It is also proposed that the land will be ceded to the conservation estate within this timeframe.
Confidence in offset result (%)	95	As negotiations have already begun with the current landowner and the proposed vesting agency, there is a very high level of confidence that the offset will be achieved.
Duration of offset implementation (maximum 20 years)	20	As the offset site will be transferred to the conservation estate, the maximum duration of 20 years is applied.
Time until offset site secured (years)	1	It is expected that the purchase and transfer of the land will occur within 12 months of the clearing.
Risk of future loss WITHOUT offset (%)	15	The land is currently zoned 'rural' and there is some risk that the site could be cleared.
Risk of future loss WITH offset (%)	5	As the offset site will be transferred to the conservation estate, the risk of loss is reduced.
Offset ratio (relevant to conservation area only)		N/A

Calculation/element	Score	Rationale
Time until ecological benefit (years)	1	As for calculation 1
Confidence in offset result (%)	95	As for calculation 1
Duration of offset implementation (maximum 20 years)	20	As for calculation 1
Time until offset site secured (years)	1	As for calculation 1
Risk of future loss WITHOUT offset (%)	15	As for calculation 1
Risk of future loss WITH offset (%)	5	As for calculation 1
Offset ratio (relevant to conservation area only)		N/A

From the above information, the *offset value* is calculated as:

- Carnaby's cockatoo: **121.3 per cent** of the minimum offset required to address the *significant residual impact* (step 2, part C).
- Threatened ecological community: **112.9 per cent** of the minimum offset required to address the *significant residual impact* (step 2, part C).

A minimum *offset value* of 100 per cent indicates that a proposed offset is likely to address the *significant residual impact* in respect to an environmental value. In this example, the value of the proposed offset exceeds 100 per cent for both of the overlapping environmental values. Using the **What-if Analysis** button, the minimum offset required to achieve an *offset value* of 100 per cent is calculated as:

- Carnaby's cockatoo: 20.61 hectares.
- Threatened ecological community: 2.66 hectares.

Example 2: One environmental value, two types of offset

An applicant applies for a permit to clear 5.4 hectares of native vegetation in 'good' condition that comprises habitat for Carnaby's cockatoo, which is ranked as 'endangered'. The applicant does not propose onsite rehabilitation after clearing.

The regulatory agency's assessment identifies that an offset is required. The applicant approaches a local government authority to help identify an area suitable for revegetation. It proposes 11 hectares of revegetation to connect two areas of remnant native vegetation within an existing reserve designated for conservation and recreation purposes. The applicant provides funding to prepare a revegetation plan and agrees to meet the cost of broadscale seeding and weed control, as well as ongoing monitoring of the revegetation.

As the revegetation is not sufficient to offset the clearing, the applicant also proposes to provide funding to DBCA to purchase 3.5 hectares of native vegetation (at a separate location to the revegetation) for transfer to conservation tenure. No on-ground management is proposed for this offset.

In using the offsets calculator, *area* is considered to be appropriate to the environmental value impacted in this instance.

As the offsets package refers to two separate locations, the *offsets calculation* is undertaken separately for each type of offset (i.e. land acquisition and on-ground management) to determine the *offset value* to the environmental value.

Step 1: Determining conservation significance

Calculation/element	Score	Rationale
Conservation significance		
Description	Carnaby's cockatoo	5.4 ha of black cockatoo habitat will be impacted.
Type of environmental value	Species (flora/fauna)	Drop-down list
Conservation significance of environmental value	Rare/threatened species – endangered	Drop-down list

From this information, the *conservation significance score* is generated as **1.20 per cent**.

Step 2: Calculating significant residual impact

Part A: Significant impact calculation

Calculation/element	Score	Rationale
Significant impact		
Description	5.4 hectares of black cockatoo habitat	Clearing of 5.4 ha of native vegetation in 'good' condition that includes habitat for black cockatoos.
Significant impact (hectares)	5.4	5.4 ha of black cockatoo habitat will be impacted.

Calculation/element	Score	Rationale
Quality (scale)	5	Site value for Carnaby's cockatoo is considered to be 'good' based on information supplied by the applicant.

From this information, the *total quantum of impact* is calculated as **2.70**.

Part B: Rehabilitation credit calculation

Calculation/element	Score	Rationale
Rehabilitation credit		
Description		No rehabilitation credit is proposed
Proposed rehabilitation (area in hectares)		
Current quality of rehabilitation site (scale)		
Future quality WITHOUT rehabilitation (scale)		
Future quality WITH rehabilitation (scale)		
Time until ecological benefit (years)		
Confidence in rehabilitation result (%)		

From this information, the *rehabilitation credit* is calculated as **0.00**.

Part C: Significant residual impact calculation

By subtracting the *rehabilitation credit* (part B) from the *total quantum of impact* (part A), the *significant residual impact* is calculated as **2.70**.

Step 3: Calculating offsets

Offset type 1: On-ground management

Calculation/element	Score	Rationale
Offsets		
Description	Revegetation	
Proposed offset (area in hectares)	11	Revegetation of 11 hectares of cleared land using foraging species suitable for Carnaby's cockatoo.
Current quality of offset site (scale)	2	The area to be revegetated contains very little native vegetation. However as the area provides connectivity between two areas of remnant native vegetation, it does provide the site context and habitat value.
Future quality WITHOUT offset (scale)	2	As the area has been bare for a considerable period of time, it is unlikely the site would regenerate to provide habitat suitable for Carnaby's cockatoo over the next 20 years without management. No change is anticipated from current quality without the offset.

Offset type 2: Land acquisition

Calculation/element	Score	Rationale
Offsets		
Description	Land acquisition	
Proposed offset (area in hectares)	3.5	The provision of $80,000 to DBCA to purchase 3.5 hectares of Carnaby's cockatoo habitat.
Current quality of offset site (scale)	8	The native vegetation to be acquired is in 'very good to excellent' condition.
Future quality WITHOUT offset (scale)	7	It is considered that the quality of the habitat may decrease slightly over the next 20 years without the security of the offset due to clearing for exempt purposes or other land degradation factors.

Calculation/element	Score	Rationale
Future quality WITH offset (scale)	5	The applicant will provide funding to a local government authority to undertake broadscale seeding and weed control for 20 years, in accordance with an approved revegetation plan. It is therefore expected that the revegetation will achieve a reasonable quality as foraging habitat for Carnaby's cockatoo.
Time until ecological benefit (years)	20	It is considered that the revegetation will achieve a quality score of 5 as Carnaby's foraging habitat within 20 years.
Confidence in offset result (%)	80	There is a high level of confidence that the revegetation will achieve a quality score of 5 within 20 years.
Duration of offset implementation (maximum 20 years)	20	The revegetation will be established, monitored and managed for a period of 20 years by a local government authority.
Time until offset site secured (years)	0	The revegetation will occur within an existing reserve (conservation and recreation purpose) and no additional security is proposed.
Risk of future loss WITHOUT offset (%)	0	The offset site contains no vegetation and hence there is zero risk of loss of in situ biodiversity values without the offset.

Calculation/element	Score	Rationale
Future quality WITH offset (scale)	8	No on-ground management is proposed as part of the offset, and thus the site's quality is considered unlikely to improve beyond its current quality over the next 20 years. However, reservation will avoid the likely decline in quality as a result of clearing for exempt purposes and allow broader-scale threat management.
Time until ecological benefit (years)	1	Arrangements for the purchase of the land have begun, and it is expected that the transfer will be complete within 12 months.
Confidence in offset result (%)	95	There is a high level of confidence that the land will be purchased and that the habitat quality will not deteriorate with the offset's implementation.
Duration of offset implementation (maximum 20 years)	20	The offset site will be protected in perpetuity – the mechanism for this is yet to be determined, however transfer to conservation tenure is preferred.
Time until offset site secured (years)	1	The reduction in risk of loss will occur as soon as the land is transferred.
Risk of future loss WITHOUT offset (%)	30	The offset site is located in an urban-zoned area with a structure plan but does not have any environmental approvals. There is a moderate risk of loss.

Calculation/element	Score	Rationale
Risk of future loss WITH offset (%)	5	Although the reserve is currently managed for a conservation and recreation purpose, there is a small risk of future loss, such as due to changes of tenure or infrastructure proposals.
Offset ratio (relevant to conservation area only)		N/A

Calculation/element	Score	Rationale
Risk of future loss WITH offset (%)	5	Acquisition and transfer to conservation estate (pending) will reduce the risk of loss of the site.
Offset ratio (relevant to conservation area only)		N/A

From the above information, the *offset value* is calculated as:

- Revegetation: **66.8 per cent** of the minimum offset required to address the *significant residual impact* (step 2, part C) to the environmental value.
- Land acquisition: **34.1 per cent** of the minimum offset required to address the *significant residual impact* (step 2, part C) to the environmental value.

The total value of the proposed offsets package is calculated by adding the percentages together. A sum of 100 per cent indicates that a proposed offsets package is likely to meet the minimum offset required to address the *significant residual impact* to an environmental value. In this example, the total value of the proposed offsets package is [66.8 per cent + 34.1 per cent =] **100.9 per cent**.

Example 3: Overlapping environmental values, one offset

A proponent receives approval to clear 45 hectares of native vegetation in ‘very good’ condition that comprises habitat for the western ringtail possum (ranked as ‘critically endangered’) for an infrastructure project. Eighteen hectares of the same vegetation also comprises habitat for the bush-tailed phascogale (ranked as a ‘priority’ species). No onsite rehabilitation credit is possible as the impacts will be permanent.

The regulatory agency’s assessment identifies that an offset is required. As an offset, the applicant proposes the revegetation and covenanting of a 240-hectare lot of cleared land to provide additional habitat for the two fauna species. The revegetation will be done in accordance with an approved revegetation plan.

In using the offsets calculator, *area* is considered to be appropriate to the environmental values impacted in this instance.

As the environmental values have different *conservation significance* scores, the step 1, step 2 (part A and part C) and step 3 calculations are undertaken separately for each type of environmental value using the apportioned impact and offset areas indicated above.

The proponent will use a single offset to satisfy both environmental values being impacted. The offset site will be managed for conservation purposes in the long term.

Step 1: Determining conservation significance

Calculation 1: Western ringtail possum

Calculation/element	Score	Rationale
Conservation significance		
Description	Western ringtail possum	Impact to 45 hectares of western ringtail possum habitat.
Type of environmental value	Species (flora/fauna)	Drop-down list
Conservation significance of environmental value	Rare/threatened species – critically endangered	Drop-down list

Calculation 2: Brush-tailed phascogale

Calculation/element	Score	Rationale
Conservation significance		
Description	Brush-tailed phascogale	Impact to 18 hectares of brush-tailed phascogale habitat.
Type of environmental value	Species (flora/fauna)	Drop-down list
Conservation significance of environmental value	Priority species	Drop-down list

From this information, the *conservation significance score* is automatically generated as:

- Western ringtail possum: **6.8 per cent**
- Brush-tailed phascogale: **0.1 per cent**

Step 2: Calculating significant residual impact

Part A: Significant impact calculation

Calculation 1: Western ringtail possum

Calculation/element	Score	Rationale
Significant impact		
Description	45 hectares of western ringtail possum habitat	Clearing of 45 hectares of native vegetation which is habitat for western ringtail possum.
Significant impact (hectares)	45	This is the area of western ringtail possum habitat that will be impacted by the proposal.

Calculation 2: Brush-tailed phascogale

Calculation/element	Score	Rationale
Significant impact		
Description	18 hectares of brush-tailed phascogale habitat	Clearing of 18 hectares of native vegetation which is habitat for brush-tailed phascogale.
Significant impact (hectares)	18	This is the area of brush-tailed phascogale habitat that will be impacted by the proposal.

Calculation/element	Score	Rationale
Quality (score)	8	Although the average vegetation condition is considered to be 'very good', site surveys show that the impacted vegetation is high quality habitat for the western ringtail possum and will further fragment remaining habitat.

Calculation/element	Score	Rationale
Quality (score)	8	The habitat requirements of brush-tailed phascogale are closely aligned with those of the western ringtail possum, which is used as a proxy.

From this information, the *total quantum of impact* is calculated as:

- Western ringtail possum: **36.00**
- Brush-tailed phascogale: **14.40**

Part B: Rehabilitation credit calculation

Calculation 1: Western ringtail possum

Calculation/element	Score	Rationale
Rehabilitation credit		
Description		No rehabilitation credit is proposed
Proposed rehabilitation (area in hectares)		
Current quality of rehabilitation site (scale)		
Future quality WITHOUT rehabilitation (scale)		
Future quality WITH rehabilitation (scale)		

Calculation 2: Brush-tailed phascogale

Calculation/element	Score	Rationale
Rehabilitation credit		
Description		No rehabilitation credit is proposed
Proposed rehabilitation (area in hectares)		
Current quality of rehabilitation site (scale)		
Future quality WITHOUT rehabilitation (scale)		
Future quality WITH rehabilitation (scale)		

Calculation/element	Score	Rationale
Time until ecological benefit (years)		
Confidence in rehabilitation result (%)		

Calculation/element	Score	Rationale
Time until ecological benefit (years)		
Confidence in rehabilitation result (%)		

From this information, the *rehabilitation credit* is calculated as:

- Western ringtail possum: **0.00**
- Brush-tailed phascogale: **0.00**

Part C: Significant residual impact calculation

From the *total quantum of impact* carried forward from part A and the *rehabilitation credit* carried forward from part B, the *significant residual impact* is calculated as:

- Western ringtail possum: **36.00**
- Brush-tailed phascogale: **14.40**

Step 3: Calculating offsets

Calculation 1: Western ringtail possum

Calculation/element	Score	Rationale
Offset		
Description	Land acquisition and on-ground management	The proposed offset will revegetate an area of freehold land. The land will also be covenanted.
Proposed offset (area in hectares)	240	The proposed offset will revegetate and covenant 240 hectares of freehold land which is adjacent to the impacted area and provides an ecological linkage to remaining remnant vegetation.
Current quality of offset site (scale)	1	The offset area does not contain any remnant vegetation. However, the site does provide connectivity to areas of existing habitat.
Future quality WITHOUT offset (scale)	1	Due to past land use, it is unlikely the site would regenerate to provide habitat suitable for the western ringtail possum over the next 20 years without intensive management. No change is anticipated from current quality.
Future quality WITH offset (scale)	6	Revegetation with species to create habitat for the western ringtail possum. In addition, weed control and fencing to prevent herbivore access and infill planting is proposed. The quality of the site is expected to significantly improve as a result, providing habitat for the western ringtail possum.
Time until ecological benefit (years)	10	It is anticipated it will take 10 years until the revegetation provides western ringtail possum habitat.
Confidence in offset result (%)	80	There is a high level of confidence that the revegetation will achieve a quality score of 6 in about 20 years.
Duration of offset implementation (maximum 20 years)	20	The revegetation project is a 10-year project, with funding for an additional seven years of on-ground management. The land will be covenanted and managed for conservation in the long term so the maximum duration of 20 years is applied.
Time until offset site secured (years)	1	It is expected the covenant will be in place within 1 year.

Calculation/element	Score	Rationale
Risk of future loss WITHOUT offset (%)	0	The offset site contains no vegetation and therefore there is zero risk of loss of in situ biodiversity values. Note that although the current zoning of the land is rural and there is a risk the site may be developed in future, risk of loss that reflects the zoning is only used for currently vegetated areas.
Risk of future loss WITH offset (%)	10	Once vegetated, the offset site (currently rural zoned) will be covenanted and managed for conservation purposes and therefore has a moderate to low risk of loss.
Offset ratio (relevant to conservation area only)		N/A

From this information, the *offset value* is calculated as 100.7 per cent of the minimum offset required to address the *significant residual impact* (step 2, part C) for this environmental value.

A minimum *offset value* of 100 per cent indicates that a proposed offset is likely to address the *significant residual impact* in respect to an environmental value. In this example, the value of the proposed offset exceeds 100 per cent. Using the **What-if Analysis** button, the minimum offset required to achieve 100 per cent is 238.41 hectares.

As the overlapping value is another fauna species with similar habitat requirements, the offset is designed to address both values. This is then tested in calculation 2 to ensure that the offset quantum is sufficient to counterbalance the significant residual impact for this value.

Calculation 2: Brush-tailed phascogale

Calculation/element	Score	Rationale
Offsets		
Description	Land acquisition and on-ground management	As for calculation 1
Proposed offset (area in hectares)	240	As for calculation 1
Current quality of offset site (scale)	1	As for calculation 1
Future quality WITHOUT offset (scale)	1	As for calculation 1
Future quality WITH offset (scale)	6	As for calculation 1
Time until ecological benefit (years)	10	As for calculation 1
Confidence in offset result (%)	80	As for calculation 1

Calculation/element	Score	Rationale
Duration of offset implementation (maximum 20 years)	20	As for calculation 1
Time until offset site secured (years)	1	As for calculation 1
Risk of future loss WITHOUT offset (%)	0	As for calculation 1
Risk of future loss WITH offset (%)	10	As for calculation 1
Offset ratio (relevant to conservation area only)		N/A

From this information, the *offset value* is calculated as >100 per cent of the minimum offset required to address the *significant impact* (step 2, part A) to this environmental value.

Appendix C: Rationale for scores used

Area

Calculation/element	Score	Rationale
Conservation significance		
Description		
Type of environmental value		
Conservation significance of environmental value		
Landscape-level value impacted?	yes/no	
Significant impact		
Description		
Significant impact (hectares)		
Quality (scale)		
Rehabilitation credit		
Description		
Proposed rehabilitation (area in hectares)		
Current quality of rehabilitation site (scale)		
Future quality WITHOUT rehabilitation (scale)		
Future quality WITH rehabilitation (scale)		
Time until ecological benefit (years)		
Confidence in rehabilitation result (%)		
Offsets		
Description		
Proposed offset (area in hectares)		
Current quality of offset site (scale)		
Future quality WITHOUT offset (scale)		
Future quality WITH offset (scale)		
Time until ecological benefit (years)		
Confidence in offset result (%)		
Duration of offset implementation (maximum 20 years)		
Time until offset site secured (years)		
Risk of future loss WITHOUT offset (%)		
Risk of future loss WITH offset (%)		
Offset ratio (relevant to conservation area only)		
Landscape-level values of offset	N/A	Check this element is included in offset if impacted

Feature

Calculation/element	Score	Rationale
Conservation significance		
Description		
Type of environmental value		
Conservation significance of environmental value		
Landscape-level value impacted?	yes/no	
Significant impact		
Description		
Type of feature		
Number		
Rehabilitation credit		
Description		
Start number (of type of feature)		
Future number WITHOUT rehabilitation		
Future number WITH rehabilitation		
Time until ecological benefit (years)		
Confidence in rehabilitation result (%)		
Offsets		
Description		
Start number (of type of feature)		
Future number WITHOUT offset		
Future number WITH offset		
Time until ecological benefit (years)		
Confidence in offset result (%)		
Landscape-level values of offset	N/A	