



## APPENDIX D-4 ENVIRONMENTAL OFFSETS STRATEGY

## 1. ENVIRONMENTAL OFFSET STRATEGY

The Queensland Government Environmental Offsets Policy (QGEOP) (EPA, 2008) states that the project design considered in an EIS for a significant project should aim to avoid and minimise environmental impacts, before consideration of an environmental offset. This was done in the EIS, for example through project design, vegetation clearing and fauna relocation processes, and environmental management plans.

The QGEOP also states that if there are remaining impacts covered by a specific-issue offsets policy(s), the intention to provide offsets in line with the policy(s) should be signalled. The only existing specific-issue offsets policy of relevance is the Policy for Vegetation Management Offsets (PVMO; Version 2.4; DERM, 2009) and the EIS noted SunWater's intention to satisfy the policy.

However, the QGEOP further states that for significant projects the Coordinator General may also require offsets for impacts not currently covered by a specific-issue offsets policy. The Queensland Government Draft Policy for Biodiversity Offsets (PBO, EPA, 2009) is currently under consultation and aims to be a specific-issue offsets policy for important biodiversity values. The biodiversity values covered by the draft policy and their relationship to the Project are noted below:

- Protected area estate – not impacted;
- Marine Parks – not impacted;
- High conservation wetlands – not impacted;
- Endangered, Vulnerable or Rare (near-threatened) species – some threatened species are impacted; and
- Endangered or Of Concern Regional Ecosystems (RE's) – some RE's in these categories are impacted.

The Australian Government Draft Environmental Offsets Policy (DEWR, 2007) sets out the use of environmental offsets under the EPBC Act. A compliant offset is required to meet the following objectives:

- a) Environmental offsets should be targeted to protected matter being impacted;
- b) A flexible approach should be taken to design and use of environmental offsets to achieve long term and certain conservation outcomes that are cost-effective for proponents;
- c) To deliver real conservation outcomes;
- d) Should be developed as a package of actions that may include both direct and indirect offsets;
- e) As a minimum should be commensurate with the magnitude of the impacts of the development and ideally deliver outcomes that are 'like for like';
- f) Located within the same general area as the development;
- g) Should be delivered in a timely manner and be long lasting; and
- h) Should be enforceable, monitored and audited.

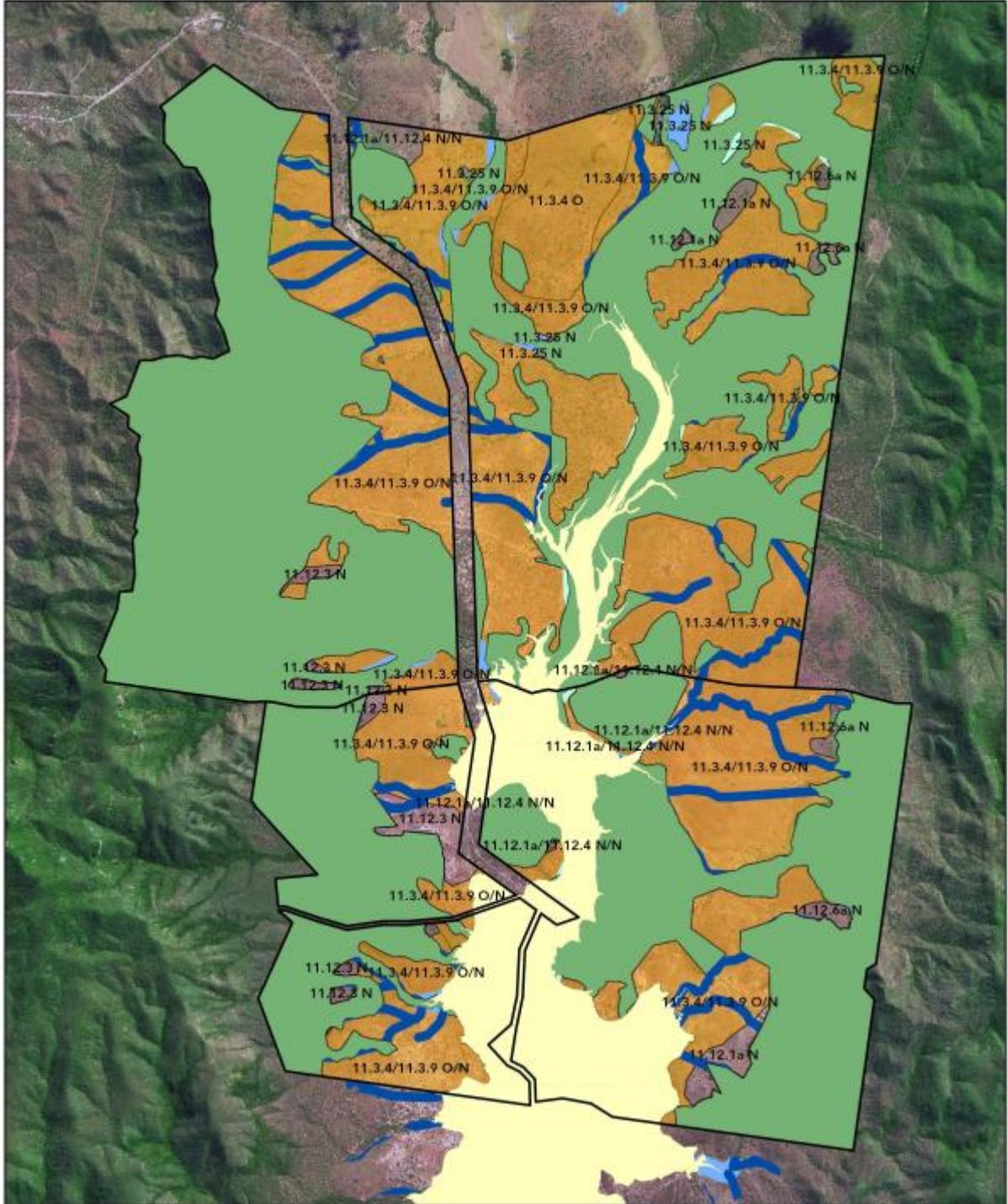
The Queensland and Australian government offset policies are cognisant of each other, meaning an offset which satisfies the PVMO policy may also be suitable to satisfy the EPBC Act policy or Biodiversity policy. As such, co-location of offsets is acceptable where the outcome with respect to each policy is achieved.

In recognition of Queensland and Australian Government offset policies and of the residual impacts after avoidance and mitigation identified in the EIS, SunWater has developed a draft offsets package, termed the 'Environmental Offset Strategy', which incorporates a significant portion of the land parcels impacted by the dam and inundation area. The primary components of the Environmental Offset Strategy, including a discussion on how the offsets have been determined and which impact they specifically relate to, is summarised below. SunWater used the services of Greening Australia then Ecofund to develop the draft strategy. The strategy has been developed based on the assessment of the project as presented in the EIS. Development of the project through the detailed design phase will likely reduce the level of impact and therefore the level of offset required. As such, while the need for offsets is recognised and committed to, the residual impacts which require offset cannot be precisely defined till detailed design is undertaken. Any offsets related to changes to the Project since the EIS have not yet been incorporated into the figures.

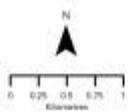
### 1.1. Strategic approach to development of the Draft Environmental Offset Strategy

The draft offset strategy has been developed in recognition of relevant offset policies and of the residual impacts after mitigation. The area of land to be included in the offsets package has been estimated by Ecofund to be approximately 4750 ha plus Order 5 watercourse offset and that which may arise if threatened plant species cannot be avoided on the pipeline route. As SunWater will be acquiring several properties that are impacted by the dam and inundation area, satisfaction of offset requirements commenced by reviewing the availability of suitable offsets on these properties. Hence, the offsets would be provided in close proximity to the area of impact. The area of land on just the two main impacted properties (Collaroy and Ridglands) is approximately 36,800 ha, of which a large proportion is remnant though it has traditionally been grazed. The country is of high ecological value, comprising the mountain range separating the coast from inland, the first major waterways draining the western side of this range, the next major mountain range and the intervening valley. It has a substantial altitudinal variation and abuts two State Forests. The remnant forest across the properties to be purchased represents a very significant and largely contiguous area of high value habitat. Figure 1-1 and Figure 1-2 show the fragmented patches of non-remnant habitat within the larger expanse of remnant habitat. Maximising the environmental value of offsets within that mosaic is not a simple process and will require discussion with key agencies.

Undercliff Property Analysis



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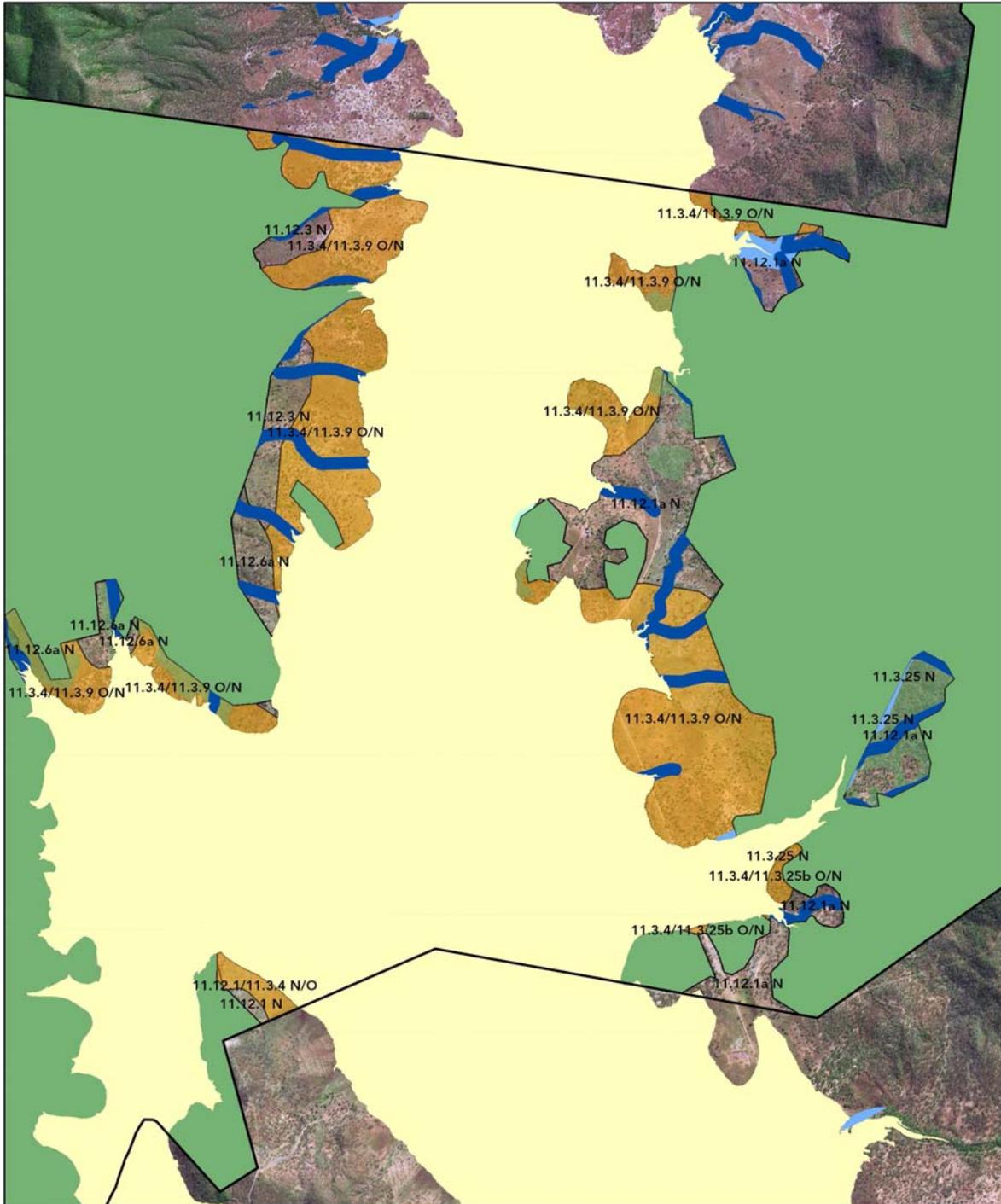
- Remnant vegetation
- Inundated area
- Property boundary
- HVR vegetation
- Stream Order 1 or 2
- Of Concern Area remnant
- Stream Order 3 or 4
- Preadar boundaries
- Stream Order 5 or more

This map was prepared using regional vegetation data derived by the Queensland Department of Environment and Heritage Management. Areas of property maps of sensitive vegetation (PVCs) are not shown on this map.

Revised April, November, 2010  
Regional Vegetation, as the 2009 2009  
Images: IPCT 1, 2009  
Cartographer: March 2009 (2009)  
Horizontal Datum: GDA94

Figure 1-1 Undercliff Property Analysis displaying fragmented patches of non-remnant habitat

**Ridgeland Property Analysis**



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Ecofund Queensland Pty Ltd  
May 2010  
Sunwater, Connors River Dam

**Legend:**  
 - Property boundary (black line)  
 - Remnant vegetation (green)  
 - Stream Order 1 or 2 (blue)  
 - Stream Order 3 or 4 (light blue)  
 - Stream Order 5 or more (cyan)  
 - Inundated area (yellow)  
 - HVR vegetation (light green)  
 - Preclear boundaries (dashed line)  
 - Of concern non remnant (orange)

**Scale:**  
0 0.25 0.5 0.75 1  
Kilometres

**Metadata:**  
 This map uses the certified regional ecosystem data defined by the property/riparian extent for the purpose of the Vegetation Mgt Act 1999. Areas of property maps of assessable vegetation (PMAV) are not shown on this map.  
 Inundated areas: Sunwater, 2010  
 Regional Ecosystems: 08 Nov 2009 (DERM)  
 Heagerty SPOE S, 2008  
 Cultural data: March 2010 (DERM)  
 Horizontal Datum: GDA84

**Figure 1-2 Ridgeland Property Analysis displaying fragmented patches of non-remnant habitat**

Ecofund reviewed the area of suitable offsets and determined that there will be more than sufficient to provide the necessary offsets for this Project, other than for Order 5 watercourse offsets. For example the area of impacted Order 1 or 2 watercourse vegetation is approximately 56.24 ha while that available as offset on the core properties is approximately 700 ha. However this is not always the case for specific vegetation types. As such the offset strategy proposes that some flexibility be afforded such that the value of strategic in-filling of habitat gaps and the protection and enhancement of areas of remnant habitat to ensure continuity of the overall purchased habitat, is recognised. This will be achieved through active weed and feral animal control, fire management and exclusion of cattle grazing from key areas.

The land available collectively provides substantial feeding, roosting and breeding opportunities for wildlife of the region. The offsets package, when managed for biodiversity purposes, will make significant contribution to the long term management of project related impacts and will have the benefit of securing habitat for local wildlife and will also assist in enhancing habitat for listed plants within the Project area. SunWater suggests management of remnant habitat may assist satisfaction of EPBC Act offset requirements and as these areas are contiguous with VM Act proposed offset areas, will add substantially to the biodiversity benefit of the offset package.

SunWater intends to use the remaining available offsets on the properties, after offsetting for the Connors River Dam and Pipelines project, for other projects in the same bioregion and to manage those areas which are not part of the offset strategy for beneficial purposes that do not conflict with the long term attainment of the offset outcomes.

The approach to constructing the strategy was as follows:

- Determine the areas of relevance to each policy based on EIS data then address the PVMO first. This was because the PVMO also indirectly addresses fauna habitat and movement requirements.
- Assess the offset available on the core properties relative to PR S.3 Watercourses. This was undertaken first because of the importance of watercourse vegetation as movement corridors and because the definition contains both threatened and least concern vegetation communities.
- Assuming co-location of offsets was appropriate, add the offsets required to satisfy PR S.7 Endangered and Of Concern ecosystems as it relates to both the PVMO and PBO and the offsets related to EPBC threatened ecological communities (flora).
- Address the requirements relative to PR S.4 Connectivity through strategic infilling that includes patches of non-remnant vegetation in critical linking areas.
- Address the requirements of PR S.8 Essential Habitat.
- Address the habitat offset requirements of threatened species (both State and Commonwealth) assuming co-location where appropriate with the offsets generated above.
- Address the requirements of threatened species not directly associated with terrestrial habitat (Fitzroy River Turtle).

Each policy also requires that the environmental outcome or benefit obtained from the offset be equal or greater than the level of residual impact being offset. As such, multipliers are used for the area impacted. On advice from

Ecofund, SunWater has used offset ratios of 2:1 for PVM offsets and 3:1 for NCA and EPBC offsets in order to develop the strategy. While SunWater has developed its draft environmental offset strategy on this basis and by recognising co-location benefits, the final strategy will require negotiation with DERM and SEWPAC (formerly DEWHA). Further, as finalisation of the offset ratios requires a comparison of the condition of the impacted environmental value with that offered as an offset, SunWater has commenced condition assessments in order that the strategy can be expeditiously finalised, agreed and implemented.

## 1.2. Vegetation management

The Project will include clearing of native remnant vegetation for which a permit is required under the Queensland Vegetation Management Act 1999 (VM Act). Clearing associated with the Project will be for a relevant purpose under section 22a of the VM Act, that is a declared significant project under the State Development and Public Works Organisation Act 1971 (SDPWO Act).

The clearing application for the Project will address the performance requirements in Part S of the Regional Vegetation Management Code (RVMC) for Brigalow Belt and New England Tablelands Bioregions. Within Part S of the RVMC there are ten specific performance requirements that must be met in order to gain development approval. How the proponent intends to comply with each of the performance requirements is briefly discussed below.

- PR S.1: Limits of clearing – Clearing will be limited to the extent necessary for the Project;
- PR S.2: Wetlands – Not applicable as there are no natural wetlands mapped in the Project area;
- PR S.3: Watercourses – Clearing will be limited in the riparian zones to within 1.5 m of the new FSL. However the Project will unavoidably impact on watercourse vegetation for construction of the dam, the inundation area and along the pipeline corridor. As a result, vegetation offsets will be provided in accordance with the PVMO (Table 1).
- PR S.4: Connectivity – Fragmentation will result from inundation of the water storage area and clearing of the pipeline corridor. While Acceptable Solution (AS) S.4.1 may apply at times to the pipeline and AS S.4.2 to the dam, some areas of fragmented remnant vegetation may require vegetation offsets.
- PR S.5: Soil erosion – Is applicable and will be managed in accordance with the Project EMP.
- PR S.6: Salinity – Not applicable as clearing will not contribute to waterlogging or salinisation.
- PR S.7: Conserving remnant endangered and of concern regional ecosystems (REs) – The Project will unavoidably impact remnant endangered and of concern REs. None of the REs listed in Table 4 of the RVMC are impacted by the Project. In the case of RE 11.3.1 and RE 11.4.8, as the area impacted is less than 0.5 ha, AS S.7 may apply. For all other endangered and of concern REs vegetation offsets will be provided in accordance with the PVMO (Tables 2, 3 and 4).
- PR S.8: Essential Habitat – Areas of essential habitat for the Little Pied Bat (rare under NC Act) are mapped as occurring on the pipeline route.
- PR S.9: Conserving status thresholds – Not applicable as none of the REs listed in Table 5 of the RVMC are mapped in the Project area.

- PR S.10: Acid sulphate soils – Not applicable as the Project area is not within the applicable sub-regions and is above 5 m AHD.

Table 1-1 shows the areas of regional ecosystems captured by the PR S.3 Watercourse objectives which are in addition to those captured by PR S.7 (Table 1-2, Table 1-3, Table 1-4). They are presented separately because several impacted RE's, most noticeably 11.3.4 and 11.3.25, are captured by PR S.3 and / or PR S.7 and / or with requirements of biodiversity offsets. Differences between the figures shown here and those in the EIS related to riparian offsets result from the use here of the DERM buffer distances according to stream order.

Table 1-1 Impacted watercourse vegetation in addition to threatened Regional ecosystems

Stream order	RE	Short Description	Area (ha)
1 or 2	11.3.9	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. Woodland on alluvial plains.	5.44
	11.5.3	<i>Eucalyptus populnea</i> ± <i>Acacia aneura</i> ± <i>E. melanophloia</i> woodland on Cainozoic sand plains/remnant surfaces.	6.98
	11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. And <i>Corymbia</i> spp. Woodland on Cainozoic sand plains/remnant surfaces.	16.24
	11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks.	26.63
	11.12.9	<i>Eucalyptus platyphylla</i> woodland on igneous rocks	0.95
3 or 4	11.3.9	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. Woodland on alluvial plains.	3.08
	11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. And <i>Corymbia</i> spp. Woodland on Cainozoic sand plains/remnant surfaces.	2.31
	11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks.	9.77
5 or greater	11.3.9	<i>Eucalyptus platyphylla</i> , <i>Corymbia</i> spp. Woodland on alluvial plains.	28.79
	11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. And <i>Corymbia</i> spp. Woodland on Cainozoic sand plains/remnant surfaces.	5.99
	11.12.1	<i>Eucalyptus crebra</i> woodland on igneous rocks.	23.94
TOTAL			130.12

The ground-truthed vegetation communities for the dam construction footprint, inundation area and pipeline easement are listed in Tables 2-4 along with their vegetation management class or biodiversity status if it is Of Concern or Endangered (addressing PR S.7 and the QGEOP). Differences between the figures shown here and those in the EIS relate to the inclusion here of the Biodiversity Status and with respect to the pipeline, to the

inclusion of realignments described in Part C Section 2 of this supplement to the EIS. It should also be noted that figures may alter slightly as detailed design progresses.

Table 1-2 Areas of Endangered or Of Concern RE's impacted by the dam construction footprint

RE	VM Act Class	Biodiversity Status	Short Description	Area (ha)
11.3.4	Of Concern	Of Concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. tall woodland on alluvial plains	10.55
11.3.25	Not of Concern	Of Concern	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	4.36
11.12.8	Of Concern	Of Concern	<i>Eucalyptus shirleyi</i> woodland on igneous rocks	7.04
8.12.16	Of Concern	Of Concern	Low microphyll vine forest to semi-evergreen vine thicket on drier sub coastal hills on Mesozoic to Proterozoic igneous rocks.	1.51
<b>TOTAL</b>				<b>23.46</b>

Table 1-3 Areas of Endangered or Of Concern RE's impacted by inundation

RE	VM Act Class	Biodiversity Status	Short Description	Area (ha)
8.12.16	Of Concern	Of Concern	Low microphyll vine forest to semi-evergreen vine thicket on drier sub coastal hills on Mesozoic to Proterozoic igneous rocks.	2.98
11.3.2	Of Concern	Of Concern	<i>Eucalyptus populnea</i> dominant woodland. Upper terraces, remnant colluvial terraces and silty outwash plains.	176.31
11.3.4	Of Concern	Of Concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Tall woodland on alluvial plains.	709.03
11.3.25	Least Concern	Of Concern	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	719.90
11.12.8	Of Concern	Of Concern	<i>Eucalyptus shirleyi</i> woodland on igneous rocks.	1.59
<b>TOTAL</b>				<b>1609.81</b>

Table 1-4 Areas of Endangered or Of Concern RE's impacted by the preferred pipeline easement

RE	VM Act Class	Biodiversity Status	Short Description	Area (ha)
11.3.1	Endangered	Endangered	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains.	0.12
11.3.2	Of Concern	Of Concern	<i>Eucalyptus populnea</i> woodland on alluvial plains.	25.78
11.3.4	Of Concern	Of Concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Tall woodland on alluvial plains.	13.76
11.3.25	Least Concern	Of Concern	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines.	5.88
11.4.8/11.4.9	Endangered	Endangered	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains and <i>Acacia harpophylla</i> shrubby open forest to woodland with <i>Terminalia oblongata</i> on Cainozoic clays plains.	0.33
11.4.13	Least Concern	Endangered	<i>E. orgadophila</i> open-woodland. Occurs on Cainozoic clay plains. The soils associated with this regional ecosystem are often derived from weathered basalt.	4.1
11.9.5	Endangered	Endangered	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	1.14
11.12.8	Of Concern	Of Concern	<i>Eucalyptus shirleyi</i> woodland on igneous rocks.	0.60
TOTAL				51.71

The total area of vegetation to be offset in order to satisfy the requirements of the PVMO with respect to PR S.3 and PR S.7 and the threatened ecosystem requirements of the QGEOP is 1812.40 ha based on EIS mapping and updated pipeline alignment mapping.

An additional 62.36 ha relates to PR S.8, being Essential Habitat of the Little Pied Bat. SunWater will determine the existence of essential habitat factors in the potential impact area and proposed offset area prior to finalising the offset strategy.

With respect to PR S.4 Connectivity, the existing vegetation within the project area is already highly fragmented, thus creating remnant and non-remnant patches, in the alluvial area and lower slopes as a result of historic clearing, burning and grazing practices. Inundation will affect all or parts of some of these patches, the latter resulting in smaller patches on the perimeter of the water storage. The exact area of these patches has not yet been quantified. The offset strategy proposes to prioritise areas for use as offsets where they can also serve as strategic in-filling that would provide linkages between patches and remaining remnant habitat or other proposed offset areas.

A property vegetation management plan will be developed for each offset area to ensure long term success of the offset and will include measures for planting maintenance, weed and pest management and a monitoring program.

### 1.3. Biodiversity offsets related to Endangered or Of Concern Regional Ecosystems

The tables above show that the biodiversity status of impacted ecosystems is equivalent to or lower than the VM Act class for all RE's except 11.3.25 and 11.4.13, the latter represented by 4.1 ha on the preferred pipeline alignment. RE 11.3.25 was noted in the EIS as riparian vegetation associated with watercourses so an offset is required in order to satisfy PR S.3 Watercourses. SunWater therefore recognises an additional need to provide a biodiversity offset for areas of RE 11.4.13 that may be impacted by the pipeline though it is likely that the impact can be reduced during detailed design via minor realignment. Such realignment would occur on a single land parcel so does not alter the assessment of any other form of impact.

### 1.4. Biodiversity offsets related to EPBC threatened ecological communities

The EIS reported that no flora communities listed under the EPBC Act were observed within the dam construction area or inundation area.

Up to 1.59 ha of endangered Brigalow plus 0.67 ha of regrowth was mapped on the preferred pipeline alignment (shown as RE 11.3.1, RE 11.4.9 and RE 11.9.5 in Table 4). As was shown on Figure 10-8 and 28-5a to 28-5d of the EIS, much of this potential impact can be avoided by minor realignment of the pipeline through the detailed design process. SunWater proposes that any remaining impact is offset by protection and rehabilitation of suitable vegetation immediately adjacent to the pipeline easement and preferably to the precise area of impact. This would most likely include acquisition of an appropriate form of tenure from the adjacent landholder and implementation of long term management measures to ensure the community was viable. There is no equivalent habitat available within the properties associated with the dam.

The Bluegrass (*Dicanthium* spp) dominant grasslands of the Brigalow Belt was considered a potential occurrence on the pipeline route. None of the RE's that constitute the community (11.3.21, 11.4.4, 11.8.1 or 11.9.12) were mapped on the pipeline route but the consultant considered there was a possibility that the community could still occur. A summer survey was recommended and SunWater commits to undertake such a survey. Given the lack of mapping of representative communities unless the summer survey determines otherwise, it is considered that no impact will occur. As with Brigalow, if the community is found to be on the preferred alignment, the approach to mitigation will be firstly to move the pipeline in order to avoid impact and if this cannot be achieved then the impact will be offset in the local area.

### 1.5. Biodiversity offsets related to threatened flora species

Only *Cerbera dumicola*, listed as Near Threatened under the NC Regulation, has been confirmed within the dam construction area. No threatened plant species were found within the inundation area. *Cerbera dumicola* is associated with the patch of 6.7 ha RE 8.12.16 which is partly impacted by dam construction and inundation. The plant occupies about 1.92 ha of the impacted patch. Impacts to nearly 4.5 ha of RE 8.12.6 is required to be offset to comply with the PVMO. The EIS suggested attempting to translocate impacted individuals where it was feasible or using local seeds to propagate the species and use in rehabilitation or plant within the unimpacted

habitat, which SunWater undertook to fence and protect. These procedures accord with the offset requirements suggested in the draft Policy for Biodiversity Offsets. It should also be noted that approximately 703 ha of remnant RE 8.12.6 exists on the properties immediately surrounding the inundation area along with approximately 392 ha of non-remnant RE 11.9.4a, which is in the same broad vegetation group.

The EIS noted the potential for three Near Threatened species, *Actephila sessiliflora*, *Marsdenia hemiptera* and *Rourea brachyandra* to exist in the dam and surrounds area. They were not found within the impact area despite intensive searches and they were considered most likely to be found to the east of the water storage in RE 8.12.6 or within a sub-type of RE 11.3.25. As the offset strategy currently includes the requirement to offset approximately 4.5 ha of RE 8.12.6 as well as approximately 729 ha of RE 11.3.25, SunWater does not envisage a requirement for additional offset related to these species.

One Near Threatened species (NC Regulation) was confirmed in a single small patch on the pipeline alignment; *Bertya pedicellata*, and the potential for occurrence of the Near Threatened *Persoonia amaliae* and *Rourea brachyandra*, and the Vulnerable (NC and EPBC) *Eucalyptus raveretiana* was recognised (Table 10-26 of the EIS) based on the presence of small areas of suitable habitat for these species. Similarly the perennial grasses *Digitaria porrecta* (Endangered under NC and EPBC), *Dichanthium queenslandicum* (Vulnerable under NC and EPBC) and *Dichanthium setosum* (Vulnerable under NC and EPBC) may occur within a 4.1 ha patch of RE 11.4.13. The EIS recommended a summer survey to determine if the species were actually present and if so, minor route realignment to avoid the plants. If this was not possible then translocation was recommended. SunWater commits to undertake the summer survey and to act upon the recommendation. Should realignment and translocation not sufficiently reduce the impact then the habitat types will be included within the offset strategy. As noted, these relate to only relatively small areas so should not be difficult to obtain.

No EPBC listed threatened flora species were actually observed on the pipeline alignment.

## 1.6. Biodiversity offsets related to threatened fauna species

Squatter pigeon (Vulnerable NC and EPBC), Little Pied Bat (Near Threatened NC) and Cotton Pygmy Goose (Near threatened NC and Migratory EPBC) were identified in or near the dam site and a number of other species were considered likely occurrences at times. The EIS concluded that impacts to all of these species would not be significant, were often classified as “minimal” and were sometimes positive, such as with respect to waterbirds and some migratory species. The EIS concluded that habitat offered as part of the Offset Strategy would satisfy any residual impacts. As such, no additional offsets for threatened fauna are included within the strategy.

Southern Squatter pigeon was the only EPBC threatened species recorded from the dam and surrounds area though Red Goshawk (vulnerable) and Australian Painted Snipe (vulnerable) were considered potential occurrences. Squatter pigeon was also the only species recorded from the pipeline alignment but another 7 vulnerable species were considered possible. The EIS noted that approximately 1830 ha of habitat for the Squatter pigeon will be impacted in the dam and surrounds area plus approximately 165.82 ha on the current preferred pipeline alignment but the pigeon was also commonly recorded outside of the inundation area including in cattle yards and on roadways where it took dust baths. The vegetation offset included as part of the project offset strategy, totalling over 4750 ha, includes habitat which is largely also suitable for the Squatter pigeon. SunWater has reviewed the threatening processes and assessed how the land to be purchased as part of the

Project can be managed to provide an offset for the species. The threatening processes relate mainly to land clearing, grazing, weeds and feral animals. SunWater will therefore offer to manage additional areas of what is currently remnant habitat in a manner which removes or significantly reduces these threats. The area will be determined through discussions with SEWPAC but it is anticipated that areas which abut proposed other offset components would be most beneficial as this increases the continuity of available suitable managed habitat.

### **1.7. Biodiversity offsets related to threatened fauna species not associated with terrestrial habitats**

Fitzroy river turtle (Vulnerable NC and EPBC) was predicted to exist within and near the dam and water storage area and field studies have confirmed this. As a result, all mitigation strategies specified in the EIS and SEIS will be employed. Section 13 of the SEIS concludes that a minor residual impact will exist after mitigation strategies are employed. As a result, SunWater offers an environmental offset.

The direct offset is offered in two geographically distinct areas, upstream of the dam and downstream. The offset is the protection and management of sections of river and riparian zone which are known (or may be confirmed in the future) to support the species. Upstream of the dam the offset will be co-located with watercourse related vegetation offsets but with monitoring specifically related to the turtle (described in Section 13). While this offset is directly relevant, all habitat management actions within the storage catchment will contribute to improving the habitat for the species.

The environmental offset strategy for the project already includes the need to find and secure suitable Order 5 stream watercourse vegetation and SunWater aims to achieve this as far as possible in the area immediately downstream from the dam. This will be of direct benefit to the Fitzroy River turtle. Secure tenure would need to be negotiated and agreed with the landowner/s. Management measures would include reduction of grazing pressure, weed control and feral animal control. It is suggested that further survey be directed at this region to identify areas of greatest utility to the species, particularly nesting areas, and that these be the target of management actions.

The SunWater Board and shareholding ministers have also approved a commitment of \$4M from the dividend reinvestment scheme toward design, construction and monitoring of turtle transfer systems. The approved project is will be conducted at a critical existing barrier in the Fitzroy catchment. It is envisaged that a weir will be fitted with a basic design and it will then be modified depending on results of monitoring. DERM turtle experts will assist with the process and Central Queensland University will be invited to participate by way of postgraduate research projects. It is expected that the Project, which has commenced, will continue over approximately 2 years. The results will be used to inform the design of turtle transfer facilities on any future dams or weirs and enable informed retrofitting to existing structures. The project has direct links to the “Overcoming the barriers – fishways” component of the approved regional NRM body (Fitzroy Basin Association) investment plan.

SunWater is the proponent or joint proponent for three projects in the Fitzroy catchment (Connors River Dam, Nathan Dam and Lower Fitzroy Weirs) and each of these projects is likely to have residual impacts on the Fitzroy River Turtle after implementation of all mitigation strategies. Each is likely to offer direct offsets in or near its area of impact as has been done for Connors River Dam above. SunWater recognises the potential for cumulative impacts on the species. SunWater suggests that a catchment wide research and monitoring program, linked to the necessary monitoring associated with each project, should be implemented. It is only relatively recently that night time sampling techniques using spotlighting have been shown to be an effective means of finding the species. Coupled with a sparse geographic sampling effort over the years as a result of limited funding,

SunWater suggests that a systematic survey using the now recognised most useful techniques, is highly likely to significantly increase the known range of the species and the estimates of population density. If one reviews Figure 4.2 of Limpus *et al* (2007) for example, there are no known occurrences between Cardowan and a point near where the Mackenzie River joins the Dawson River, a distance of over 250 river kilometres. This is highly unlikely to be correct as the species is known to exist both upstream and downstream and only two sites have historically been sampled in the area. Similarly the recent photographic evidence of a specimen from Glebe Weir on the Dawson River increases the range by 100 river kilometres from Theodore Weir and it is very likely that the species will be found in between these two locations and probably upstream of Glebe Weir. SunWater is currently investigating the latter as part of the Nathan Dam and Pipelines Project.

SunWater offers to commit \$100,000 per annum per constructed project for a period of 5 years. The design of the program would be formulated via discussion with SEWPAC, DERM and relevant researchers. It is intended to link the funding to "Biodiversity and Vegetation" component of the existing FBA regional NRM plan and to Central Queensland University research programs in order that the SunWater seed funding can be used to leverage further funding or in-kind support, thereby substantially increasing the scope of the project. The "Biodiversity and Vegetation" component of the regional NRM plan includes Fitzroy River Turtle as a focus species and community engagement in turtle conservation, primarily through Greening Australia and other volunteers protecting nest sites in certain downstream areas, has been very successful. For example it was suggested that approximately 90% of nests are predated without protection.

SunWater suggests that the research should be directed at both ecological parameters (distribution, abundance, location of nesting areas etc) and at practical means to reduce the impact of existing structures. As SunWater manages a number of existing structures in the system, such knowledge will be very useful with respect to possible adjustment of the operational regimes in order to reduce incidental impacts to turtles. Limpus *et al* (2007, page 16-17) suggested that with such a catchment wide approach "it will be possible to reverse the negative impact of not only the new infrastructure developments but to also compensate for the cumulative impacts".