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PART A - INTRODUCTION TO SUPPLEMENTARY REPORT

1. PURPOSE OF THE SUPPLEMENTARY REPORT

This Supplementary Report to the Connors River Dam and Pipelines Environmental Impact Statement (EIS) has been prepared in response to submissions received by the Coordinator-General following the public notification period of the EIS. The EIS was prepared in accordance with the Terms of Reference (ToR) prepared by the Coordinator-General under the *State Development and Public Works Organisation Act 1971* and in accordance with the Bilateral Agreement between the State of Queensland and the Australian Government made under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* EPBC Act.

On 16 August 2010 the Coordinator-General requested SunWater to prepare a Supplementary Report to address the issues raised in submissions received. Figure 1-8 of the EIS is reproduced below (Figure 1-1) to show the position of the Supplementary Report in the steps of EIS preparation.

The purpose of the Supplementary Report is not to duplicate the original EIS, but to provide further clarification of specific issues raised in submissions.

The Supplementary Report will be provided to the Coordinator-General for consideration in preparing the Coordinator-General's report.

Since release of the EIS the Project has further developed and the Supplementary Report provides an opportunity to make these developments known to the Coordinator-General. The developments generally represent refinement of elements of the Project but also include an additional section of property access road. The main areas of refinement are the pipeline route, changed spillway design, proposed vegetation and biodiversity offset strategy and the land acquisition requirements. These are described in Part C of the Supplementary Report and the offset strategy is further addressed in Appendix D-4.

1.1. Consultation process since release of the EIS

The consultation process for the EIS was described in the EIS. The process was broad ranging and thorough and it is noted that no comments were received on this aspect of the EIS. The EIS was publicly released for comment on 6 February 2010. The comment period closed on 22 March 2010. Immediately prior to release a public notice was placed in newspapers circulated in the local area, the State and nationally. The notice stated:

- where copies of the EIS were available for inspection;
- how it could be purchased (or obtained free of charge);
- that submissions may be made to the Coordinator-General about the EIS;
- the date by which submissions must be made; and
- the address for submissions.

During the display period SunWater undertook a range of consultation activities as summarised below:

- placed hardcopies of the EIS at 4 locations for viewing (Moranbah, Nebo, Mackay and Brisbane);
- distributed 273 electronic copies on CD Rom;

- placed 2 advertisements in three regional newspapers (in addition to CG required advertising in State and national newspapers) describing the EIS and submission process;
- distributed Newsletter 3 to approximately 250 stakeholders and placed it at 3 locations;
- held public information sessions at Moranbah and Nebo;
- held a Community Liaison Group meeting in Nebo;
- held agency briefings in Brisbane and Mackay (which Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) attended); and
- maintained the Project web site and 1800 number.

A consultation report for this period is included as Appendix A.

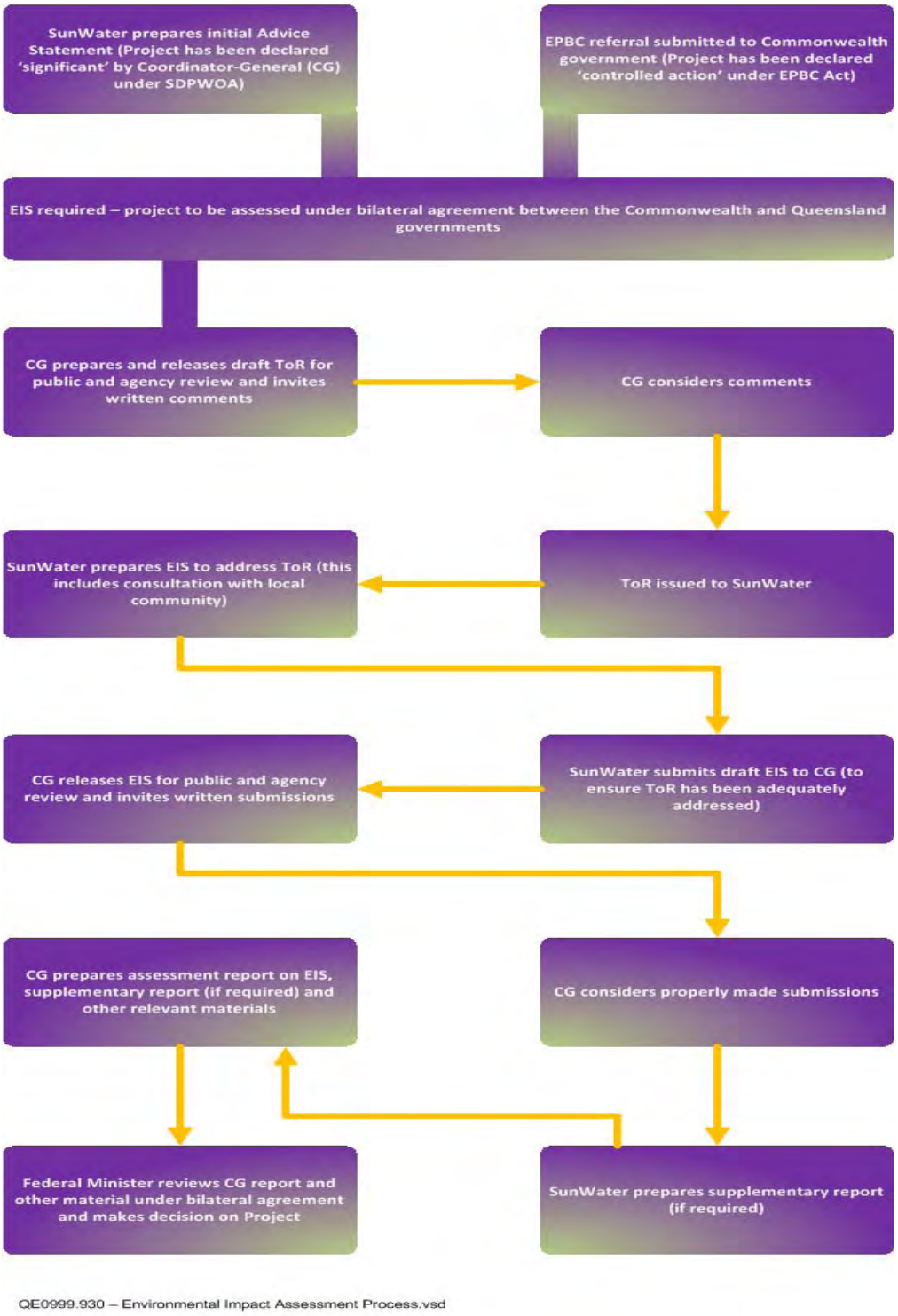


Figure 1-1 Key Steps in EIS preparation

2. ANALYSIS OF SUBMISSIONS

2.1. Number and source of submissions

Fifteen submissions on the EIS were received by the Coordinator-General. These comprised two from individuals, four from organisations, one from local government and eight from State government departments. The source of submissions is summarised in Table 2-1. The Coordinator-General accepted submissions received after the formal closure of the submission period and these have been included. It is noted that for privacy, the identity of private submitters is not provided.

Table 2-1Source of submissions

Submission number	Submitter
1	Department of Transport and Main Roads
2	Construction, Forestry, Mining and Energy Union
3	Queensland Conservation Council
4	Department of Infrastructure and Planning, Local Government and Planning Group
5	Private
6	Department of Community Safety
7	Queensland Health
8	Private
9	Department of Environment and Resource Management
10	Department of Communities
11	Queensland Police Service
12	Powerlink Queensland
13	Department of Employment, Economic Development and Innovation
14	Isaac Regional Council
15	Queensland Rail

2.2. Methodology for response to submissions

Each submission was reviewed to identify the issues raised. The issues were recorded in an issues database. Each issue was allocated an individual identification number comprised of the submission number and the issue number within that submission. For example, 13.9 is the ninth issue identified in Submission 13. A comprehensive list of the issues raised in each submission is provided in Appendix B.

Part B of this Supplementary Report responds to the issues raised and is structured to align with EIS chapter headings. Within each chapter the specific issues raised are pooled into broader issues so that related issues can be addressed in a coordinated manner. The table in Appendix B cross references each specific issue to the section of the Supplementary Report in which it can be found.

The Supplementary Report provides technical responses to the issues raised in submissions and provides conclusions with regards to the key issues raised in the submissions. As previously discussed, the purpose of the Supplementary Report is not to duplicate the original EIS, having already prepared an EIS in accordance with the ToR, but to provide further clarification of specific issues raised in submissions. Furthermore, the EIS as released is a public document and cannot be altered. Where submissions noted typographical errors, incorrect cross references or suggested changes to wording these amendments are addressed in Appendix C as the EIS cannot be reissued with these changes.

Some points raised in submissions represented information provided for the proponents benefit but were not issues that required a response. All submitters who provided such information are thanked and the information will be used at the appropriate time should the Project proceed.

Some submissions represent the respondents view on broad issues, such as disagreeing with dams *per se*, or contained general statements that the EIS was inadequate. If the submitter did not specifically identify in what way the EIS was inadequate, such as by offering an alternative assessment methodology, identifying an overlooked relevant report or finding a technical error in a calculation, then a response is not possible other than restating what is already in the EIS.

There were also a number of points which suggested various plans or outputs should be completed within the EIS phase. In most cases those plans represent the outcome of standard mandatory processes that will occur at the appropriate time with respect to project approvals and the design process. Bringing them forward makes no material difference to the ability of agencies or the public to assess the prudence or feasibility of the project and as they are a requirement of standard planning processes, their development is assured.

PART B - RESPONSE TO SUBMISSIONS

1. INTRODUCTION

The following key issues were raised by submitters in relation to the Introduction section of the EIS:

- Need for the project;
- Consequential impacts associated with water supplied from the dam;
- Alternatives to the project, particularly the use of coal seam water; and
- Within project alternatives.

1.1. Need for the Project

SunWater has had no indication from potential coal mine clients, or from the State Government, that the life of coal mines that may be supplied by the project is restricted to 20-30 years.

Forecast urban demand was presented in Section 1.3.3 of the EIS. Urban demand represents approximately 5% of the probable high priority yield of the storage. That volume may be contracted directly by the Isaac Regional Council or via another client (or group of clients) on their behalf. As urban water supply represents a high priority allocation it would be distributed by the same trunk pipeline that services other high priority clients.

1.2. Consequential impacts

The EIS specifically addressed the relevant part of the EPBC Act in Sections 1.4.4 and 28.2.6.

SunWater does not accept there are any relevant "events or circumstances" that will arise from mining activities which may take water from the Connors River Dam because:

In terms of section 527E of the EPBC Act:

- The primary action (in this case the dam) cannot be said to facilitate to a major extent any particular secondary action (i.e. mining activity). This is because the mining industry has other sources of water available to it and SunWater expects that if the Connors River Dam did not proceed, water for any particular mining project could be sourced elsewhere.
- If however a relevant secondary action could be said to be facilitated to a major extent by the Connors River Dam then any relevant "event or circumstance" likely to have a significant impact on the relevant Matter of National Environmental Significance (MNES; World Heritage for example), and which may be a consequence of the secondary action, is definitely not within the contemplation of SunWater (the primary person), nor is such a relevant event or circumstance, whatever it might be, a reasonable consequence of the secondary action.

In terms of the SEWPAC Guidelines on this issue:

- To the extent that there may be any relevant indirect impacts (associated with mining activities) such impacts (if any) would occur irrespective of the proposed action, i.e. mining projects would continue to be developed irrespective of the Connors River Dam Project.

- The proposed action cannot be said to be a material and substantial cause of any indirect impacts. If there are any such impacts they would be a direct consequence of the mining activity which would exist in any event.
- There are no relevant potential impacts of any possible third party actions (mining activities) known to SunWater or that could be expected to be known to SunWater.

However, notwithstanding the above position SunWater is prepared to provide such information as it has been able to gather in relation to mining projects generally which may or may not take water from the Connors River Dam which may or may not generate impacts (events or circumstances). SunWater has also reviewed recent coal industry related EIS's in the region to determine their controlled action status hence their likelihood of impact on MNES. The list below was generated from the SEWPAC website and relates to recent mining projects in the region.

The following projects are in the Fitzroy catchment and were determined as controlled actions with respect to Listed threatened species and communities only. They were not a controlled action with respect to World Heritage, National Heritage places, wetlands of international importance, listed migratory species or Commonwealth marine areas:

- Xstrata Rolleston Open Cut Coal Mine Expansion;
- Wandoan Joint Venture Wandoan Coal Project;
- Anglo Coal Foxleigh Coal Mine Extension;
- Aquila Resources Washpool Coal Mine Project;
- BM Alliance Daunia Open Cut Coal Mine Project; and
- BM Alliance Norwich Park East Pit.

The North Goonyella Coal Co-disposal facility in the Connors River catchment was determined to not be a controlled action. The Cows Coal Project proposed by Bowen River Coal was not declared a controlled action (Bowen River is a reef catchment). Several of these actions and many in addition, have gone on to be approved. SunWater would only provide water to a mine which had been approved.

Further detailed discussion regarding cumulative and consequential impacts is provided within Sections 27.3.2.2, 28.2.6 and 28.4.4.7 of the EIS and Section 27.5 of the Supplementary Report.

1.3. Alternatives to the Project

As discussed in Sections 1.6.1 and 1.6.3 of the EIS, economic/financial, environmental and cultural/social criteria described in the Central Queensland Regional Water Supply Strategy (CQRWSS) were used to compare alternatives to the Project. These alternatives assessments were released with the Strategy as a series of Information Papers with the assessment criteria developed in Information Paper 4. This material is publicly available and was referenced in the EIS. The EIS also specifically updated certain assessments for which conditions had altered since the CQRWSS was produced, such as Coal Seam (CS) water.

As noted in Section 1.6.3 of the EIS, and confirmed by SunWater through development of the Surat Dawson Integrated Water Project (related to the Nathan Dam and Pipelines project), the client water demand profile means that CS water will always need a more permanent source as a foundation supply because the availability of CS water is unreliable in the long term. CS water is therefore only viable to support long term projects if there is a dam to back it up, so it is not considered an alternative to the Project but a possible adjunct.

CS water quality is also highly variable, with total dissolved solids typically in the range 1,200 to 4,300 mg/L. Currently, most CS water is disposed of in evaporation ponds but limited quantities are used for stock water, coal washing and similar activities. Water quality from Connors River Dam will be naturally very good with no dissolved solid or salt issues.

Given the variable water production rates and water quality parameters typically associated with CS water, consideration of this water as a resource has a significant number of technical challenges and cost implications.

The viability of CS water as an independent alternative to the dam is dramatically impacted due to varying factors, including the following:

- Costs of treating CS water as opposed to disposing of it by re-injection;
- Location of CSG projects in relation to centres of demand for water, such as towns and coal mines, that could be supplied by the Project;
- Location of CSG projects in relation to the pipeline that forms part of the Project and that could be used for transporting CS water of acceptable quality;
- Rate of development of CSG projects; and
- Reliability and permanence of supply of CS water.

The bulk of potentially available CS water is in the Surat Basin or southern Bowen Basin, not in the north where the Connors River Dam will be located. It is therefore a short term alternative to the proposed Nathan Dam and SunWater is incorporating this alternative within the Surat Dawson Integrated Water Project. It is not a viable alternative in the Connors River Dam area.

1.3.1. Within project alternatives

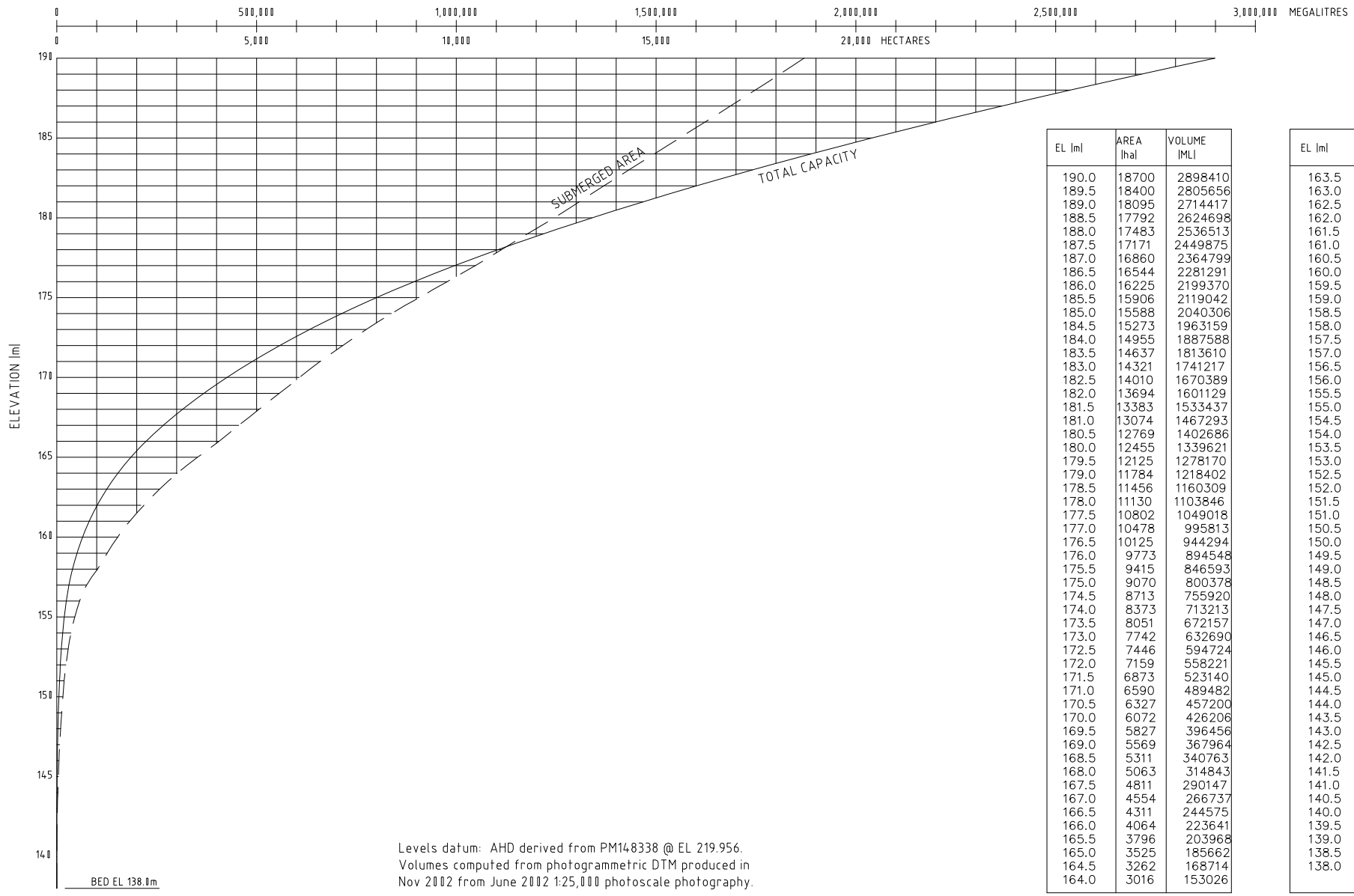
The storage volume proposed for the Connors River Dam is larger than any suggested in the CQRWSS. SunWater reviewed a range of capacity options and found that storages larger than the current proposal would not meet the outcomes of the Water Resource Plan (WRP) because while they could capture more water, they needed to release more water to satisfy the Environmental Flow Objectives (EFO's) and Water Allocation Security Objectives (WASO's). This requirement added significantly to the capital and operating cost of the structure but produced incrementally less yield per dollar. As the storage size increased, so would the related environmental impacts as a result of an increased scale of works, increased impact footprint and potential changes to the flow regime. Figure 2-15 of the EIS, reproduced as Figure 1-1 in the Supplementary Report shows the storage area curve for the site.

Connors River Dam is not an alternative to the Lower Fitzroy Weirs project. The CQRWSS recognised the requirement for infrastructure based on subregional need. Connors River Dam and the Lower Fitzroy Weirs service different subregions. The Statewide Water Policy Regional Infrastructure Plan also recognised the need for both. To release water from Connors River Dam to satisfy needs in Rockhampton would be highly inefficient from a water transfer perspective due to the very long distance involved and the relative lack of intervening storages or areas of significant extraction. The impacts on the flow regime of such a long length of regulation would also likely have significant environmental consequences and would be highly unlikely to satisfy WRP objectives, either current or future. The CQRWSS envisaged Nathan Dam on the Dawson River as the source of water for emergency supplies to Rockhampton or to the Statewide Water Grid because it was a much larger storage and could feed through an already highly regulated system (the Dawson Valley Water Supply Scheme).

As stated on page 1-14 of the EIS, agricultural demand, beyond what can be achieved through release of unallocated supplies or via efficiencies that can be achieved through trading, exists but is relatively minor and likely to be price constrained. The availability of suitable agricultural land is not usually the limiting factor for irrigation development. Demand from downstream agricultural users was assessed via a questionnaire distributed to farmers. The results of the questionnaire clearly showed that demand was limited by the price of the water, together with the physical constraints on the Connors and Isaac Rivers.

The latest demand projections indicate that Stage 1 (smaller pumps supplying 31,000 ML/a) will be unnecessary and construction will proceed directly to Stage 2 (larger pumps supplying 49,500 ML/a). This relates only to the size of pump installed and carries no other impacts. Hence there will be no period in which water will be stored in the dam while awaiting contractual update by high priority customers. Similarly the only way to increase the volume of medium priority supplied from the dam would be to increase the size of the storage, which would incur all the impacts noted above.

Evaporation from the storage occurs at the same rate whether the end users are high priority (HP) or medium priority (MP) and altering the product mix but releasing the same volume of water would make little difference to the total loss. Increasing the size of the storage to accommodate greater medium priority supply would increase the total evaporation as a result of the increased storage surface area. More importantly, distribution to high priority customers by pipe incurs almost no losses compared to river release for medium priority users a long way downstream. The potential to supply more medium priority water is a moot point because very limited demand has been demonstrated and the allocation to high priority users accords with Government policy that water entitlements “allow water to flow to higher value uses, subject to social, physical and environmental constraints” (COAG 1994). The EIS has shown that there are no significant constraints and the highest value use has been prioritised.



Levels datum: AHD derived from PM148338 @ EL 219.956.
Volumes computed from photogrammetric DTM produced in Nov 2002 from June 2002 1:25,000 photoscale photography.

EL (m)	AREA (ha)	VOLUME (ML)
190.0	18700	2898410
189.5	18400	2805656
189.0	18095	2714417
188.5	17792	2624698
188.0	17483	2536513
187.5	17171	2449875
187.0	16860	2364799
186.5	16544	2281291
186.0	16225	2199370
185.5	15906	2119042
185.0	15588	2040306
184.5	15273	1963159
184.0	14955	1887588
183.5	14637	1813610
183.0	14321	1741217
182.5	14010	1670389
182.0	13694	1601129
181.5	13383	1533437
181.0	13074	1467293
180.5	12769	1402686
180.0	12455	1339621
179.5	12125	1278170
179.0	11784	1218402
178.5	11456	1160309
178.0	11130	1103846
177.5	10802	1049018
177.0	10478	995813
176.5	10125	944294
176.0	9773	894548
175.5	9415	846593
175.0	9070	800378
174.5	8713	755920
174.0	8373	713213
173.5	8051	672157
173.0	7742	632690
172.5	7446	594724
172.0	7159	558221
171.5	6873	523140
171.0	6590	489482
170.5	6327	457200
170.0	6072	426206
169.5	5827	396456
169.0	5569	367964
168.5	5311	340763
168.0	5063	314843
167.5	4811	290147
167.0	4554	266737
166.5	4311	244575
166.0	4064	223641
165.5	3796	203968
165.0	3525	185662
164.5	3262	168714
164.0	3016	153026

EL (m)	AREA (ha)	VOLUME (ML)
163.5	2791	138513
163.0	2575	125100
162.5	2371	112745
162.0	2182	101375
161.5	1998	90930
161.0	1829	81361
160.5	1667	72632
160.0	1524	64664
159.5	1386	57386
159.0	1263	50766
158.5	1146	44742
158.0	1019	39331
157.5	876	34593
157.0	749	30543
156.5	649	27055
156.0	570	23997
155.5	510	21298
155.0	452	18888
154.5	401	16758
154.0	357	14863
153.5	317	13184
153.0	285	11683
152.5	258	10329
152.0	228	9124
151.5	208	8037
151.0	186	7058
150.5	169	6169
150.0	156	5356
149.5	142	4611
149.0	126	3940
148.5	111	3348
148.0	97	2829
147.5	85	2377
147.0	73	1980
146.5	62	1644
146.0	55	1350
145.5	49	1091
145.0	42	863
144.5	34	674
144.0	28	519
143.5	22	396
143.0	18	295
142.5	14	214
142.0	11	151
141.5	7	105
141.0	6	73
140.5	4	48
140.0	3	28
139.5	2	14
139.0	1	4
138.5	0	1
138.0	0	0

Figure 1-1

NOT TO SCALE

SW 234671

SunWater Making Water Work

SKM

CONNORS RIVER DAM AND PIPELINES

CONNORS RIVER DAM
STORAGE CURVE

1.4. Project approvals

Section 1.10.2.3 of the EIS described the procedure for State and local Government planning processes and standards.

A staged program for obtaining State and local government approvals is currently being developed. Approvals will be obtained progressively primarily through the IDAS process as design and construction of the Project proceeds. Under IDAS, some development applications can be consolidated into one application. Much of this work is currently underway with a view to having relevant approvals in place to allow the commencement of construction in September 2011.

SunWater will liaise with both State and local governments should the need to seek a community infrastructure designation under the SP Act or a regulation under the SDPWO Act arise.

SunWater in consultation with Department of Infrastructure and Planning (DIP) have developed a proposed approvals pathway for the Project; this is presented in Appendix E.

Section 403 of the *Mineral Resources Act 1989* requires the consent of the owner and holder of the mining claim or lease before the property can be entered. Sections 807 and 808 of the *Petroleum and Gas Act 2004* require consent from the pipeline licence holders before works can be undertaken. As noted in Section 6.1 and Section 7.3 of the Supplementary Report, SunWater has been liaising with the relevant parties regarding access.

2. DESCRIPTION OF PROJECT

The following key issues were raised by submitters in relation to the Description of Project section of the EIS:

- Consultation in relation to the management of the recreation area;
- Source of bedding material for the pipeline;
- Inclusion of rail as part of "other infrastructure" described for the Project;
- Fishway design;
- Other construction issues such as sourcing of water, occupational health and safety compliance and stockpiling for the diversion channel.

2.1. Recreation area

Section 2.3.3.4 of the EIS noted that provision of recreational facilities would be determined through consultation with Isaac Regional Council. Newsletter 2 also noted that recreational groups would be consulted and SunWater intended that this included those with an interest in fishing or fisheries. SunWater will involve Sport and Recreation Services (Nth Qld) during consultation with Isaac Regional Council. It is also noted that Department of Transport and Main Roads (DTMR) and Fisheries Queensland have an interest in the proposed boat ramp and fishing activities at the dam.

The EIS described the recreation area as including a boat ramp, picnic facilities, septic toilet system and general landscaping. It also noted that rainwater tanks would be provided, water for ablutions would be sourced from the water storage and the area would be accessed via a purpose built access road from Connors River Collaroy Road.

As discussed in Section 2.3.3.4 of the EIS it is proposed that responsibility for maintenance and management of the recreational area will be vested in Isaac Regional Council. As the operation of any recreation area is not core business for SunWater, SunWater proposed to construct the facilities at its own cost but to hand over management to Council. This approach has been included within Public Information Sessions, newsletters, on the web site and has been discussed at Community Liaison Group meetings which Council is invited to attend. Any more detailed consultation processes regarding the specific needs of the area are viewed as the primary responsibility of the proposed operator, being Council. However, as water quality and safety around the infrastructure is of concern to SunWater and it will be funding and managing construction of the facilities, it will participate in the planning process. Tenure issues and shared obligations as a result of the location of the facilities and the activities will be discussed and agreed with Council.

SunWater is committed to design the recreation facilities in accordance with the Australian Standards Design for Access and Mobility.

2.2. Associated infrastructure

SunWater is committed to consulting with service or infrastructure providers, including Powerlink, during detailed design.

2.2.1. Pipeline bedding material extraction areas

The requirement for a quarry allocation notice under the *Water Act 2000* was included in Appendix B pages 2 and 3 of the EIS.

The estimates of available bedding material volumes described in the EIS in Section 2.2.3.2 were prepared by Golder Associates (Appendix D-1 and D-2) and related to the amount of suitable material available within each area assessed; however they did not take into account the rate of replenishment.

Field investigations for the availability of bedding material were undertaken at sites noted in Table 2-6 of the EIS and included material extraction and testing. The sites investigated were specifically targeted to avoid existing Quarry Material Allocation Notices (QMANs). The Golder Associates report also noted all the requirements for information to be included in an application for a QMAN.

Impacts of extraction are addressed in the respective EIS chapters including Section 14.5.1.3 which described a Sediment Extraction Management Plan that aims to minimise impacts on fluvial geomorphology. SunWater has since undertaken further investigation of sand replenishment rates and consulted directly with DERM on the methodology (Hydrobiology 2010; Appendix D-3). DERM staff also accompanied the consultant on field inspections. The results of those inspections showed that ample resource existed at the nominated sites and the excavated pits would be in-filled by natural sand movement within 1-2 years. This report will now form the basis of permit applications.

2.2.2. Rail

As noted in Section 2.2.3 of the EIS, "Associated infrastructure includes all other infrastructure required to be constructed, upgraded, relocated or decommissioned for the construction and/or operation of the Project". No rail infrastructure meets those criteria. The only interaction of the Project with rail infrastructure relates to the crossing of one rail line and the possible alignment of a section of pipeline route beside a rail easement. Figure 2.13-5 and 2.13-6 of the EIS show the pipeline route crossing the Norwich Park Branch line just west of Coppabella (noting that the railway line was incorrectly referred to as the Millennium Loop in the EIS). SunWater will liaise with QR on the detailed design for crossing the line and the appropriate tenure options.

Figure 2.13-6 of the EIS also shows the pipeline route to the south of the QR rail line on the non-preferred northern option within Area 6. SunWater also has an existing pipeline in this area as mentioned in Section 2.2.2 of the EIS. The northern option in Area 6 is non-preferred and further investigation will only be undertaken if the southern option proves unviable. The southern option does not interact with rail infrastructure.

2.2.3. Fishway

The Queensland Primary Industry and Fisheries (QPIF) Fish Passage Design Process and Criteria was referenced in the EIS (p13-41, Section 13.2.1.2). The detailed design of the fishway will be finalised following further consultation with relevant agencies and experts, and will be in general accordance with the process provided by QPIF.

SunWater acknowledges the need to consult with Fisheries Queensland regarding all stream crossings unless the crossings are constructed in accordance with the relevant self assessable code under the Fisheries Act 1994.

The requirement or otherwise for on-site staff to operate the fishway will depend upon the final design of the structure hence cannot be confirmed until such time.

The promotion of fish passage during and after the decommissioning of the project will be considered as part of any future decommissioning plan.

2.2.4. Spillway

Section 2.5.1.4 of the EIS discussed the design of the spillway. The EIS proposed that the downstream face of the left and rights abutments non-overflow sections would be stepped and the downstream face of the spillway section located centrally in the river bed would also be stepped. SunWater will change the initially proposed stepped spillway to a smooth spillway. The design of the stilling basin and energy dissipation device will, as noted in the EIS, be further developed to reduce the potential for impact to fauna including fish and turtles and will be cognisant of advice previously provided by DERM and DEEDI. Further information is provided in Section 13.1 of the Supplementary Report.

2.3. Construction

2.3.1. Diversion channel

As discussed in Section 2.5.1.13 of the EIS all spoil from the construction of the diversion channel will be stockpiled on the right bank of the river for later use in construction. SunWater acknowledge that when stockpiling, spoil material should be placed far enough away from the river to ensure there is minimal risk of any of the material from entering the river during flood events. The management of stockpiles in this area will be specifically addressed in the Sediment and Erosion Control Plan and will be provided with appropriate runoff control, potentially including bunding.

2.3.2. Pipeline

The pipeline will be underground in the vicinity of the Mac Coppabella Accommodation Village.

2.3.3. Water

There is no intention to take water from the Braeside borefield. Details of other potential sources and volumes of construction water will be developed during detailed design and forwarded as part of the permit application process. Overland flow dams utilised during the construction phase will be in accordance with the WRP.

Estimates of the volumes of water required during construction are provided in Section 2.5.3.3 of the EIS.

2.4. Construction camps

Section 2.5.9.4 of the EIS noted that the camps would comply with all occupational health and safety requirements including those related to food preparation and storage however the Food Act 2006 was not

specifically mentioned. The camps will comply with all occupational health and safety including the Food Act 2006.

It is anticipated that each camp will include a licensed bar in order that worker travel offsite is minimised. A Code of Conduct for the camps and a Behaviour Management Plan in relation to alcohol use was noted in Section 24.3 of the EIS.

The construction camps will be designed and built in accordance with State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide.

3. CLIMATE AND NATURAL DISASTERS

3.1. Climate change

With respect to Table 3-2, the climate change data included is correctly referenced. Both EIS and Q2 data are drawn from the same CSIRO / BOM reference. The Q2 numbers relate to a very large region extending from the coast west to Barcaldine and south to Dalby whereas the EIS focussed on data related to the actual study area as near as it could be sourced. This resulted in differences between the Q2 and EIS data but the latter is more representative of the Project area.

4. TOPOGRAPHY AND GEOMORPHOLOGY

No issues were raised with respect to this section.

5. LANDSCAPE CHARACTER AND VISUAL AMENITY

No issues were raised with respect to this section.

6. GEOLOGY AND SOILS

6.1. Regulatory framework

The relevance of the *Petroleum and Gas Act 2004* and the *Mineral Resources Act 1989* is noted in Section 1.4 of the Supplementary Report. SunWater has been liaising with all leaseholders in respect of placement of the water pipeline route.

7. LAND USE AND INFRASTRUCTURE

The following key issues were raised by submitters in relation to the Land Use and Infrastructure section of the EIS:

- Impact on stock routes;
- Inclusion of rail as part of "other infrastructure" described for the Project;
- Consultation with other infrastructure service providers; and
- Need for controlled grazing within the dam catchment.

7.1. Stock routes

A number of stock routes are potentially impacted by the pipeline route. The non-preferred northern pipeline route option within Area 6 intersects stock route U831 east of Moranbah and runs parallel in an easterly direction before intersecting the Peak Downs Highway, which is designated as stock route M404. The pipeline route runs parallel to and crosses the Peak Downs Highway close to where the Fitzroy Development road merges with the Peak Downs Highway.

Prior to finalisation of the pipeline route:

- Local governments affected by the proposal will be engaged to ensure they are aware of and can manage disruptions using appropriate mitigation measures;
- The DERM Senior Lands Officer (Stock Routes) and local government stock officer will be consulted;
- Provision of safe realigned or replacement stock routes will be considered and provided. This will include any affected infrastructure and will consider watering points; and
- Rehabilitation of impacted stock routes will be undertaken and will include revegetation with native pastures.

7.2. Controlled grazing of water storage catchment

SunWater aims to manage the land it acquires around the water storage for beneficial purposes that do not conflict with the achievement of project requirements with respect to environmental offsets. As the offset package has not been finalised, the alternative or conjunctive uses cannot be finalised. There is potential that controlled grazing will be allowed, however it will need to be supported by infrastructure, such as the proposed new access road into Marylands, and be conducted in such a way that does not conflict with areas required as offsets. This will require fencing to exclude cattle from some areas, provision of offstream watering points, controlled stocking rates to prevent land degradation and strict control of stock transported on to site to ensure no new weeds are imported. The potential benefits of controlled grazing with respect to fire and weed control and to SunWater's ongoing land management costs is acknowledged.

7.3. Petroleum pipeline licences

The relevance of the *Petroleum and Gas Act 2004* and the *Mineral Resources Act 1989* is noted in Section 1.4 of the Supplementary Report.

The pipeline route intersects a petroleum pipeline licence prior to crossing Denison Creek in the vicinity of Hamilton Park. Further pipelines exist immediately east of Moranbah. SunWater has been in discussions with most infrastructure owners, including those of pipelines, regarding sharing of easements or traversing tenements.

The final responsibility for selecting routes for associated infrastructure such as powerlines rests with the service provider.

8. LAND CONTAMINATION

8.1. Remediation actions

As discussed in Section 8.2.1.2 of the EIS further investigations will be undertaken at the five potentially contaminated sites within the dam and surrounds based on the requirements of the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland. The actions to be undertaken at particular sites will depend on the outcomes of further investigations, which as noted will be in accordance with the guidelines.

Table 8-5 of Section 8.2.4 of the EIS concluded that the proposed schedule of further investigations and remediation/management activities was appropriate and the residual risk to water storage water quality was Low (as low as reasonably practicable).

9. SENSITIVE ENVIRONMENTAL AREAS

No issues were raised with respect to this section.

10. TERRESTRIAL FLORA

The following key issues were raised by submitters in relation to the Terrestrial Flora section of the EIS:

- Requirements of the *Nature Conservation Act 1992.*
- Further information about the translocation program and proposed environmental offsets; and
- Further information on weed management.

10.1. Description of environmental values

10.1.1. Regional Ecosystem Status

Tables 10-2, 10-3, 10-13 and 10-15 of the EIS have been amended to include the RE status under the Queensland *Vegetation Management Act 1999* (VM Act), as well as the Biodiversity Status. The VM Act status is based on the pre-clearing and remnant extent of a regional ecosystem. The Biodiversity Status is based on an assessment of the condition of remnant vegetation in addition to the pre-clearing and remnant extent of a regional ecosystem.

Updated Table 10-2 Regional ecosystems mapped by EPA for the dam and surrounds

RE	VM Act Class	Biodiversity Status	Short Description (EPA 2005)
8.12.5	Least Concern	No Concern at Present	8.12.5a: *Lophostemon confertus* and *Eucalyptus portuensis* open-forest to closed-scrub. Occurs on steep upper slopes and spurs on Mesozoic to Proterozoic igneous rocks (subregions 1-3).
8.12.7	Least Concern	No Concern at Present	8.12.7a: *Corymbia citriodora, Eucalyptus portuensis,* and *C. trachyphloia* open-forest to woodland on hills on Mesozoic to Proterozoic igneous rocks. Occurs on Mesozoic to Proterozoic igneous rocks. Contains minor areas of Tertiary acid volcanics (land zone 8), (subregion 2). 8.12.7c: *Eucalyptus drepanophylla* and *Corymbia citriodora* ± *E. portuensis* ± *E. exserta* woodland. Occurs on dry hills on Mesozoic to Proterozoic igneous rocks. Contains minor areas of Tertiary acid volcanics (land zone 8), (subregion 2).
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.
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or Eucalyptus spp. tall woodland on alluvial plains.
11.3.9	Least Concern	No Concern at Present	*Eucalyptus platyphylla*, Corymbia spp. woodland on alluvial plains.
11.3.25	Least Concern	Of Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines. 11.3.25b: Riverine wetland or fringing riverine wetland. *Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest.
11.12.1	Least Concern	No Concern at Present	*Eucalyptus crebra* and/or *E. melanophloia* +/- *C. erythrophloia* shrubby woodland. Occurs on igneous rocks. Also includes localised areas dominated by *E. persistens*. 11.12.1a: *Eucalyptus crebra* ± *E. exserta* woodland. Occurs on undulating rises.
11.12.3	Least Concern	Of Concern	*Eucalyptus crebra, E. tereticornis, Angophora leiocarpa* woodland on igneous rocks especially granite.
11.12.4	Least Concern	No Concern at Present	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks
11.12.6	Least Concern	No Concern at Present	11.12.6a: *Eucalyptus crebra* + *Corymbia citriodora* and/or *E. acmenoides* + *Lophostemon suaveolens* woodland to open-forest.

Updated Table 10-3 Regional Ecosystems in the dam and surrounds based on ground-truthing

RE	Component Vegetation Communities	VM Act Class	Biodiversity Status	Short Description*
8.12.5**	3j	Least Concern	No Concern at Present	*Corymbia intermedia, E. portuensis* ± Lophostemon spp. ± *Syncarpia glomulifera* ± *Banksia integrifolia*, open-forest to closed-scrub on Mesozoic to Proterozoic igneous rocks.
8.12.16***	1a, 1b, 1c	Of Concern	Of Concern	Low microphyll vine forest to semi-evergreen vine thicket on drier sub coastal hills on Mesozoic to Proterozoic igneous rocks.
11.3.2	3g (A)	Of Concern	Of Concern	*Eucalyptus populnea* dominant woodland. Upper terraces, remnant colluvial terraces and silty outwash plains.
11.3.4 11.3.4a	3a 3b , 3e	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or Eucalyptus spp. tall woodland on alluvial plains.
11.3.9	3f (A)	Least Concern	No Concern at Present	*Eucalyptus platyphylla*, Corymbia spp. woodland on alluvial plains.
11.3.25 11.3.25b 11.3.25h 11.3.25f 11.3.25x**	2a 2b 4b W 4a/4c	Least Concern	Of Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.
11.5.3	3g (Cr)	Least Concern	No Concern at Present	*Eucalyptus populnea* ± *Acacia aneura* ± *E. melanophloia* woodland on Cainozoic sand plains/remnant surfaces.
11.5.9 11.5.9a	3c 3h	Least Concern	No Concern at Present	*Eucalyptus crebra* and other Eucalyptus spp. and Corymbia spp. woodland on Cainozoic sand plains/remnant surfaces.
11.12.1	3c, 3d	Least Concern	No Concern at Present	*Eucalyptus crebra* woodland on igneous rocks.
11.12.8	3i	Of Concern	Of Concern	*Eucalyptus shirleyi* woodland on igneous rocks.
11.12.9	3f (R)	Least Concern	No Concern at Present	*Eucalyptus platyphylla* woodland on igneous rocks

* Truncated descriptions as per the REDD (EPA 2007a).

** Vegetation community not currently recognized in REDD as RE sub-type. Proposed RE sub-type.

*** Outlier of CQC Bioregional area

Updated Table 10-13 Regional ecosystems on the preferred pipeline alignment and pipeline options based on a 30 m wide easement

RE	VM Act Class	Biodiversity Status	Abbreviated Description*	Pipeline Route Option**
11.3.1	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	DCC, PPA
11.3.2	Of Concern	Of Concern	*Eucalyptus populnea* woodland on alluvial plains.	DCC, PPA
11.3.3	Of Concern	Of Concern	*Eucalyptus coolabah* woodland on alluvial plains	PPA
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or Eucalyptus spp. tall woodland on alluvial plains.	CO, PPA
11.3.7	Least Concern	Of Concern	Corymbia spp. woodland on alluvial plains.	PPA
11.3.9	Least Concern	No Concern at Present	*Eucalyptus platyphylla*, Corymbia spp. woodland on alluvial plains.	PPA
11.3.10	Least Concern	No Concern at Present	*Eucalyptus brownii* woodland on alluvial plains.	DCC, PPA
11.3.25	Least Concern	Of Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	DCC, CO, PPA,
11.4.2	Of Concern	Of Concern	*Eucalyptus populnea/brownii* or *E. melanophloia* ± *Corymbia dallachiana* ± *C. tessellaris* ± *E. crebra* ± *E. platyphylla* woodland. Occurs on Cainozoic clay plains.	PPA
11.4.9	Endangered	Endangered	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains.	DCC, MO, PPA
11.4.13	Least Concern	Endangered	*E. orgadophila* open-woodland. Occurs on Cainozoic clay plains. The soils associated with this regional ecosystem are often derived from weathered basalt.	PPA
11.5.3	Least Concern	No Concern at Present	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces.	CO, MO, PPA
11.5.8	Least Concern	No Concern at Present	Melaleuca spp., *Eucalyptus crebra, Corymbia intermedia* woodland on Cainozoic sand plains/remnant surfaces	PPA
11.5.9c	Least Concern	No Concern at	*Eucalyptus crebra* and other Eucalyptus spp. and Corymbia spp. woodland on	MO, PPA

RE	VM Act Class	Biodiversity Status	Abbreviated Description*	Pipeline Route Option**
		Present	Cainozoic sand plains/remnant surfaces.	
11.5.18	Of Concern	Of Concern	*Micromyrtus capricornia* shrubland on Cainozoic sand plains/remnant surfaces	PPA
11.7.2	Least Concern	No Concern at Present	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	PPA
11.9.5	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	PPA
11.9.9	Least Concern	No Concern at Present	*Eucalyptus crebra* woodland on fine-grained sedimentary rocks.	PPA
11.12.2	Least Concern	No Concern at Present	*Eucalyptus melanophloia* woodland on igneous rocks.	PPA
11.12.6a	Least Concern	No Concern at Present	*Corymbia citriodora* open forest on igneous rocks (granite).	PPA

* Truncated descriptions as per the REDD (Queensland Herbarium Version 5.1, 2007a).
** Preferred pipeline alignment (PPA), Moranbah Option (MO).
*** Specialist riparian community for offset consideration

Updated Table 10-15 Observed Regional Ecosystems (including sub-types) in the pipeline easement

RE	VM Act Class	Biodiversity Status	Short Description	Pipeline Alignment Option**
11.3.1	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains.	DCC, PPA
11.3.2	Of Concern	Of Concern	*Eucalyptus populnea* woodland on alluvial plains.	DCC, PPA
11.3.4	Of Concern	Of Concern	*Eucalyptus tereticornis* and/or Eucalyptus spp. tall woodland on alluvial plains.	CO, PPA
11.3.9	Least Concern	No Concern at Present	*Eucalyptus platyphylla*, Corymbia spp. woodland on alluvial plains.	PPA
11.3.25	Least Concern	Of Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.	DCC, CO, PPA
11.4.8	Endangered	Endangered	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.	MO, PPA
11.4.13	Least Concern	Endangered	*E. orgadophila* open-woodland. Occurs on Cainozoic clay plains. The soils associated with this regional ecosystem are often derived from weathered basalt.	PPA
11.5.3	Least Concern	No Concern at Present	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces.	CO, MO, PPA
11.5.9	Least Concern	No Concern at Present	*Eucalyptus crebra* and other Eucalyptus spp. and Corymbia spp. woodland on Cainozoic sand plains/remnant surfaces.	MO
11.7.2	Least Concern	No Concern at Present	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	MO, PPA
11.9.5	Endangered	Endangered	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks	PPA
11.10.7	Least Concern	No Concern at Present	*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks.	PPA
11.12.1	Least Concern	No Concern at Present	*Eucalyptus crebra* woodland on igneous rocks.	PPA
11.12.2	Least Concern	No Concern at Present	*Eucalyptus melanophloia* woodland on igneous rocks.	PPA

* Truncated descriptions as per the REDD (Queensland Herbarium Version 5.1, 2007a).

**Preferred pipeline alignment (PPA); Moranbah Option (MO).

10.2. Potential impacts and mitigation measures

10.2.1. Environmental offset strategy

The draft environmental offset strategy is fully described in Appendix D-4.

10.2.2. Least concern plants

The impacts of the Project on vegetation were assessed in Section 10.2.1.1 of the EIS for the dam and surrounds and Section 10.2.2.1 of the EIS for the pipeline. This encompassed impacts on all native vegetation including least concern plants which are protected under the Queensland *Nature Conservation Act 1992* (NC Act).

As discussed in Appendix D-4 the proponent has developed an Environmental Offset Strategy which is the combination of several offsets used to meet the offset requirements of the Project.

10.2.3. EVR plants

The impacts of the Project on threatened plants listed under the NC Act and EPBC Act were assessed in Section 10.2.1.3 of the EIS for the dam and surrounds and Section 10.2.2.3 of the EIS for the pipeline. For the dam this encompassed impacts on *Cerbera dumicola* and potential impacts on *Actephila sessiliflora*, *Marsdenia hemiptera* and *Rourea brachyandra* (all listed as Near Threatened, *NC Act)*. For the pipeline this encompasses impacts on *Bertya pedicellata* (Near threatened, *NC Act*) and potential impacts on *Rourea brachyandra* (Near Threatened, *NC Act*) and four species listed under the EPBC Act; *Eucalyptus raveretiana* (Vulnerable), *Digitaria porrecta* (Endangered)*, Dichanthium queenslandicum* (Vulnerable)*, Dichanthium setosum* (Vulnerable). "Potential impacts" refers to those species that have not actually been recorded from within the dam or pipeline corridor, but have been recorded in the vicinity and are assessed as likely to occur in the dam or pipeline corridor based on the presence of suitable habitat for these species.

As described in Section 10.2.4 of the EIS, strategies are proposed to avoid and mitigate the impact on threatened species. Initially this has included designing the Project, particularly the pipeline route, to avoid or minimise the number of plants affected. Translocation or propagation using cuttings or seeds collected from the impacted plants will be implemented for any unavoidable clearing of NC Act and EPBC Act listed plants. As a minimum, a translocation and/or propagation plan will be provided for *Cerbera dumicola* and *Bertya pedicellata* as these are the only listed plants which will definitely be impacted by the dam and pipeline respectively. It is considered that translocation of *Cerbera dumicola* is a viable method, as this is a semi-deciduous small tree which is likely to be able to withstand translocation. Translocation will be backed-up by propagation of impacted plants from cuttings. Translocation of *Bertya pedicellata* is only likely to be viable for small shrubs. For larger shrubs, propagation from cuttings or seed collection is considered to be a more suitable method.

The details of the translocation and/or propagation plans will be developed when the footprint of impact is confirmed following detailed design. This will include identification of suitable relocation sites and development of protocols.

It is acknowledged that there may be a requirement to provide an offset for listed plants, should avoidance, translocation or rehabilitation not fully mitigate the impact. This would involve protecting existing known habitat

which is currently at risk of being cleared and would be included in the final Environmental Offset Strategy for the Project.

Biodiversity and habitat offsets proposed as part of the Environmental Offset Strategy will also assist in enhancing habitat for listed plants within the Project area. This will be achieved through active weed and feral animal control, fire management and exclusion of cattle grazing. Management and strategic plantings in areas of non remnant habitat would enhance natural regeneration, and strategic in-filling of non-remnant habitat areas would improve connectivity.

10.2.4. Loss of essential breeding and feeding habitat and habitat fragmentation

The EIS has assessed this issue using standard methods of ecological and habitat assessment. The investigations completed for the EIS did not find any feeding or breeding areas that were recognised as essential. Fragmentation of habitat was recognised and assessed in Table 11-10 and Table 11-11 of the EIS. The assessment found fragmentation to be the highest ranking impact and it could not be fully mitigated. Consequently, SunWater is committed to the development of an Environmental Offset Strategy involving biodiversity offsets which will address the issue of habitat fragmentation, amongst other issues, as described in Appendix D-4.

10.2.5. Weeds, pest animals and diseases

A recommendation has been made to utilise Biosecurity Queensland's Annual Pest Distribution Survey and Predictive Pest Maps to assist in the risk assessment of invasive plant and pest animals that are likely to occur in the Project area, and support the development of threat abatement plans if required.

Biosecurity Queensland's Annual Pest Distribution Maps were reviewed. The data for the maps comes from an annual pest distribution survey; information for each pest is gathered through regional workshops where participants include local government, Biosecurity Queensland officers and others with knowledge of local pest locations. Those species which are considered to be distributed within the Project area are summarised in Table 10-1. Biosecurity Queensland has also prepared Predictive Pest Maps for all declared plants of Queensland and some declared pest animals. The predictive pest maps are based on climate modelling and it is considered that the comprehensive flora surveys undertaken as part of the EIS offer more detail on the current distribution of weeds across the Project area than the predictive maps.

Table 10-1 Potential for significant weeds and pest animals in the Project area

Species	Common name	Occurrence, Distribution and Density[1]	Pest Mapping[2]	Status[3]	Occurrence in the Project Area[4]
Weeds					
Acacia nilotica	Prickly Acacia	Common - Localised	2008	Class 2	
Andropogon gayanus	Gamba Grass	Occasional – Localised - nearby	2008	Class 2	
Argemone ochroleuca	Mexican Poppy	Common - Widespread	2007	Not declared	Present

Species	Common name	Occurrence, Distribution and Density[1]	Pest Mapping[2]	Status[3]	Occurrence in the Project Area[4]
Bryophyllum spp.	Mother of Millions	Occasional - Localised	2008	Class 2	
Cascabela thevetia	Captain Cook Tree	Common - Localised	2006	Class 3	
Cecropia spp.	Mexican Bean Tree	Occasional – Localised - (Occurrence nearby)	2008	Class 1	
Cryptostegia grandiflora	Rubber Vine	Occasional - Localised	2008	Class 2	Present
Echinochloa polystachya	Aleman Grass	Occasional - Localised	2008	Not declared	
Elephantopus mollis	Tobacco Weed	Common - Localised	2005	Class 2	
Harrisia spp.	Harrisia cactus	Common - Localised	2007	Class 1	
Heteranthera reniformis	Kidneyleaf Mudplantation	Occasional - Localised	2008	Not declared	
Hymenachne amplexicaulis	Hymenachne	Abundant - Localised	2008	Class 2	
Jatropha gossypiifolia	Bellyache Bush	Occasional - Localised	2007	Class 2	
Lantana camara	Lantana	Common - Widespread	2006	Class 3	Present
Macfadyena unguis-cati	Cat's Claw Creeper	Occasional – Widespread (Occurrence nearby)	2008	Class 3	Present
Mimosa invisa	Giant Sensitive Plant	Common - Localised	2007	Class 2	
Opuntia spp.	Prickly Pear	Occasional - Widespread	2005	Class 2	Present
Opuntia spp.	Tree Pear	Occasional - Localised	2005	Class 2	Present
Parkinsonia aculeata	Parkinsonia	Occasional – Localised (Occurrence nearby)	2008	Class 2	
Parthenium hysterophorus	Parthenium	Occasional - Localised	2008	Class 2	Present
Pistia stratiotes	Water Lettuce	Abundant – Localised (Occurrence nearby)	2008	Class 2	
Salvinia molesta	Salvina	Occasional – Localised (Occurrence nearby)	2007	Class 2	
Senna spp.	Sicklepod	Occasional - Localised	2008	Class 2	Present
Sida spp.	Sida	Common - Widespread	2007	Not declared	Present
Spathodea campanulata	African Tulip Tree	Occasional – Localised	2004	Class 3	
Sphagneticola trilobata	Singapore Daisy	Common - Localised	2004	Class 3	
Sporobolus spp.	Rats Tail Grass	Abundant - Widespread	2007	Class 2	Present

Species	Common name	Occurrence, Distribution and Density[1]	Pest Mapping[2]	Status[3]	Occurrence in the Project Area[4]
Themeda quadrivalvis	Grader Grass	Common - Localised	2007	Not declared	Present
Xanthium pungens	Noogoora Burr	Occasional - Localised	2008	Not declared	Present
Ziziphus mauritiana	Chinee Apple	Common – Localised - (Occurrence nearby)	2006	Class 2	
Pest Animals					
Axis axis	Chital Deer	Common - Widespread	2008	Not declared	
Canis familiaris	Wild Dog	Common - Widespread	2007	Class 2	Present
Cervus timorensis	Rusa Deer	Common - Localised	2008	Not declared	
Felis catus	Feral Cat	Common - Widespread	2007	Class 2	Present
Oryctolagus cuniculus	Rabbit	Occasional - Widespread	2008	Class 2	Present
Rhinella marina	Cane Toad	Common - Widespread	2008	Not declared	Present
Sus scrofa	Feral Pig	Common - Widespread	2008	Class 2	Present
Vulpes vulpes	Fox	Common - Widespread	2007	Class 2	

1 Indicates the species occurrence, distribution and density within a cell of the pest distribution map:

Species occurrence – Indicates whether the species is present or absent in each cell.

Distribution – localised / widespread: Infestations that occur across more than half the cell in any density are considered widespread, while those that cover less than half the cell are considered localised.

Density – occasional / common / abundant: Refers to how thick or sparse pest distributions area - Occasional: single plants/animals spaced apart at wide intervals; Common: a middle measure between occasional and abundant;

Abundant: infestations that have reached their full potential and provide little opportunity for additional plants/animals to survive in that area.

2 Year of the annual pest distribution survey to inform Biosecurity Queensland pest distribution maps.

3 Class of the species under the *Land Protection (Pest and Stock Route Management) Act 2002*.

4 Species confirmed as occurring the Project area during the EIS field surveys.

The EIS undertook a literature review and database search to identify weeds that may occur in the Project area. The occurrence of these species was identified during the field surveys, which recorded a total of 79 naturalised species in the Project area including 10 species declared as weeds under the *Land Protection (Pest & Stock Route Management) Act 2002*. Appendix 3-9 of the EIS presented profiles of each of these species and included initial risk assessments with respect to dispersal as a result of the Project. Those species identified in the Annual Pest Distribution Maps which were recorded in the Project area are noted in Table 10-1.

Section 10.2.1.4 of the EIS acknowledged the risk of spread of declared weeds into cleared and disturbed areas from construction and operation of the dam, pipeline and associated infrastructure. With implementation of a Weed Management Plan from the outset of construction, this was assessed as being a *Low Risk* in Table 10.28 of the EIS.

The Weed Management Plan will include a risk assessment to identify those species which are likely to be an issue and that need to be addressed in the plan. The risk assessment will include declared species recorded during the field surveys, as well as additional declared species considered possible to occur from the Annual

Pest Distribution Maps (Table 10-1). Threat abatement plans, including measures to reduce the risk, will be developed for any high risk species.

Biosecurity Queensland's list of significant plant pests and diseases was reviewed to determine the potential for plant pests of economic or conservation significance to occur in the Project area. Plants pests which are considered likely to occur in the Project area are summarised in Table 10-2.

Table 10-2 Potential for significant plant pests in the region

Species	Common name	Distribution and Risk	Status[1]
Bemisia tabaci biotype B	Silverleaf Whitefly	Pest of range of crop and ornamental plants. Found throughout QLD	Emerging
Phenacoccus solenopsis	Solenopsis Mealybug	Pest of wide range of crops and weeds in Emerald and Bowen Basin. Detected in cotton crops in the Emerald and the Burdekin regions.	Exotic, notifiable
Scirtothrips aurantii	South African Citrus Thrips	Pest of ornamental and fruit crops, especially citrus. Found on mother of millions in Qld.	Emerging, notifiable
Thrips palmi	Melon Thrips	Pest of fruit and vegetables found in various parts of the state.	Emerging

1 Notifiable: Notifiable pests under Schedule 2 of the Plant Protection Regulation 2002. Legally required to report sightings to the Department of Primary Industries and Fisheries (DPI&F).
Exotic pests: Exotic plant, pests and diseases are those which are not present in Australia, or those which are present but not established and are under an official containment and/or eradication program.
Emerging pests: Emerging plant, pests and diseases are those which are present in Queensland but their presence is being monitored.

Furthermore, there are a number of plant diseases (fungus, bacteria or viruses) which have the potential to occur or become established in the Project area, such as Citrus Canker (*Xanthomonas axonopodis*), Citrus Greening (Huanglongbing) (*Candidatus Liberobacter* spp.), Myrtle Rust (*Uredo rangelii*) or Sugarcane Smut (*Ustilago scitaminea*). The majority of these affect agricultural crops (i.e. citrus fruit and sugarcane), however Myrtle Rust is a serious fungal disease that affects plants in the Myrtaceae family.

There is a low risk of the spread of plant pests and diseases from construction and operation of the dam, pipeline and associated infrastructure, as the Project does not involve transport of agricultural crops. However, there is still a risk of transport of soil pathogens through the use of earth moving machinery for construction. To minimise this risk, all construction machinery will be cleaned prior to use on site in accordance with SunWater's Weed Management Plan and any plants transported onto site for landscaping or revegetation will be tested for diseases considered to be a biosecurity risk.

11. TERRESTRIAL FAUNA

The following key issues were raised by submitters in relation to the Terrestrial Fauna section of the EIS:

- Details on survey methodology;
- Further information on mitigation measures for:
    - Habitat fragmentation;
    - Environmental offsets;
    - Listed species including least-concern species.
- Changes to suites of species; and
- Animal safety and welfare during construction.

11.1. Description of environmental values

11.1.1. Methodology

The survey techniques and survey effort for the inundation area are provided in Appendix E-4.1 of the EIS and presented again in Appendix D-5. All survey techniques were employed for the systematic survey sites. The description outlines the trapping and/or search techniques, effort and duration, and was presented for each of the fauna groups surveyed. There were no targeted surveys for conservation-significant species though the initial literature reviews identified the species that may be present and field staff were vigilant with respect to potential observations of the species.

The sites were established within selected representative habitat and were surveyed for a continuous period of five days and four nights. This is the period recommended by the EPA (1999). Intensive sampling of the inundation area targeted a total of 10 sites over two sampling periods. The sampling effort involved two observers per sampling period, totalling 12 field days per sampling period (including travel, set up and trap decommissioning time). Two field surveys were conducted during the summer/autumn and winter periods, to account for any seasonal differences in the vertebrate species assemblage of the study area, in particular winter migrants.

There are no recognised best practice benchmarks for fauna survey techniques in Qld. The Brisbane City Council (BCC) Ecological Assessment Guidelines (BCC, Unknown) provide a summary of best practice survey techniques for all major vertebrate fauna groups that occur within Brisbane City. For fauna surveys, a minimum of four days and nights survey time is recommended and adequate consideration of seasonal variations, timing, duration and climatic conditions. A review of the survey techniques employed for the Project concludes that they are comparable to the best practice fauna survey techniques recommended by BCC.

11.2. Potential impacts and mitigation measures

11.2.1. Biodiversity impacts

The EIS discusses impacts from the dam on all native wildlife in the context of loss and fragmentation of fauna habitat in Sections 11.2.1.1 and 11.2.1.2 of the EIS, as well as fauna disturbance from construction noise and

dust in Section 11.2.1.5 of the EIS and artificial lighting in Section 11.2.1.6 of the EIS. A similar assessment has been conducted for the pipeline. Appendix E-4.4 and Appendix E-4.9 of the EIS list the fauna recorded during the field surveys completed in 2009. Habitat descriptions of the dam site and pipeline corridor are provided in Section 11.1.3.4 and Section 11.1.4.4 of the EIS. These habitat descriptions include an outline of species found within the habitat, covering species of conservation significance and those listed as least concern under the NC Act.

Section 11.2 of the EIS described the impact of the Project on habitat, feeding, breeding, roosting and migratory areas. It was acknowledged that the Project will cause a loss and fragmentation of habitat areas in the inundation area of the dam and along the pipeline alignment. The EIS proposed several mitigation measures to minimise these impacts on all terrestrial fauna, including:

- Minimise habitat clearance as far as practicable;
- Delay habitat clearance until shortly before the dam becomes operational;
- Progressive habitat clearance, commencing at the dam site and continuing upstream of the dam. This will ensure that fauna move of their own volition away from impact areas and into habitats within the upper reaches of impacted waterways; and
- Engagement of a spotter-catcher to ensure that habitat trees are identified and felled in a manner which minimises injury to fauna and relocation of tree hollows to suitable un-impacted habitat.

As discussed in Appendix D-4, the offsets package for the Project will include biodiversity offsets for impacts to habitat of threatened species not completely mitigated. This will be achieved by rehabilitation and management of non-remnant habitat on land parcels surrounding the impact area to enhance connectivity and natural regeneration, and improve habitat quality through weed and feral animal control, fire management and exclusion of cattle grazing. The offset strategy has assumed collocation of offsets will be appropriate such that if offsets applicable to the VM Act also provide appropriate habitat for biodiversity offset purposes, then no additional offset is required. The clearest example is the need to satisfy PR S.8 Essential Habitat as part of VM Act offsets. Another is the requirement to offset RE 8.12.16 which is also the habitat for the NC Act listed *Cerbera dumicola*.

The offsets package will be developed in recognition of relevant offset policies and of the residual impacts after mitigation. 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, which will add substantially to the biodiversity benefit of the offset package.

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.

11.2.2. Animal welfare

Section 2.4.4 of the EIS described the vegetation clearing and fauna relocation process, including the need for spotter catchers and animal welfare requirements. Measures to ensure animal safety and welfare during

construction were detailed in the Environmental Management Plan (EMP) in Section 29.9.9 of the EIS. A system of record keeping, reporting and caring for wildlife will be established as part of the Project.

As stated in Section 11.2.11 of the EIS, a licensed spotter-catcher will be on-site throughout the construction phase to provide fauna relocation services. The fauna spotter catcher will have necessary permits for handling, removal and relocation of wildlife.

11.2.3. Changes to species suites

As noted in section 11.2.1 the EIS addressed all species, not just species of conservation significance. The focus on such species is dictated by legislation and the TOR. With respect to how impacts might affect species suites as opposed to individual species, the EIS addressed a number of types of impacts that relate to all species, or to wildlife *per se*. These included, fragmentation, edge effects, corridor impacts and clearing of various habitat types. The impact types are broad and affect habitat of all species rather than resulting in a focussed impact on individual species. As such, a top predator or key food tree is not particularly impacted so flow on effects from such an impact type are not expected.

Instead, the EIS concluded that the area surrounding the dam represented generally good quality habitat that would suit the range of species and species suites that will be impacted. Similarly ecological processes will not be affected in the large area of land surrounding the dam. In recognition of the loss of habitat, the offset strategy (Appendix D-4) aims to provide between two and three times the area of quality habitat that will be impacted. This will ensure that all wildlife has sufficient suitable habitat to occupy and no long term change to species suites is expected

12. AQUATIC FLORA

An issue was raised with respect to aquatic flora related to the EMP. It is addressed in Section 13.3 and 29.1.1.

13. AQUATIC FAUNA

The following key issues were raised by submitters in relation to the Aquatic Fauna section of the EIS:

- Impacts on Fitzroy River Turtle;
- Creation of in-stream barriers;
- Fishway and turtle transfer devices;
- Aquatic weeds and pest fish species introduction and transfer; and
- Spillway design.

13.1. Fitzroy River Turtle

13.1.1. The likely significance of local populations

This section will firstly respond to the issues raised then discuss results of the latest surveys. The EIS based its descriptions and assessment of potential impact on the same report referenced in the DERM submission (Limpus *et al.* 2007) and on EIS specific field surveys. The EIS acknowledged that field surveys specifically for Fitzroy River turtle were hampered by water clarity and other issues and drew conclusions relative to its potential distribution within and upstream based on scientific literature and assessment of available habitat.

The EIS noted the presence of Fitzroy River turtle at Cardowan approximately 17 km downstream from the proposed dam, referring to the finding of two nests and "a large number of turtles" by Limpus *et al.* (2007). Section 13.1.3.4 of the EIS stated "There is a high likelihood that the Fitzroy River turtle is present in the dam and surrounds study area (Col Limpus [DERM] 2009, pers. comm.). The study area is characterised by large, isolated, permanent pools with ephemeral riffles and large woody debris, which is similar to the habitat found on the Cardowan property where Fitzroy River turtles have been captured (Limpus *et al.* 2007). There are no known barriers between the study area and the Cardowan property. As a precautionary approach, this report assumes the species is present."

This characterisation of the study area is true of that section of the inundation area and downstream which constitutes the Connors River and larger streams but upstream of this point, and within the proposed inundation area, the river splits into a number of smaller headwater streams. As they progress upstream these become too small and ephemeral to provide suitable habitat for the Fitzroy River turtle.

A question was posed regarding the text, "Populations of both species are higher in the lower or mid-reaches of the Fitzroy Basin, with the core of the Fitzroy River turtle population in the barrage, an area which will be unaffected by any aspect of the Project. Within the Project area these species probably reach the upstream limit of their distribution and populations would be expected to be relatively low." The basis for this text is firstly the following quotes from Limpus *et al.* (2007) (underline added):

- This is a turtle which is endemic to the natural permanent riverine habitats <u>of the middle and lower Fitzroy catchment</u>.

- With further studies, it is expected that *R.leukops* will be identified inhabiting the Dawson River upstream of Theodore and in additional sites within the middle to upper Comet-Mackenzie rivers. (Note that the Connors River is a tributary of the Mackenzie and the dam is in the upper catchment of that tributary)
- The best functioning population that is recognised today, based on identified nesting, occurs within the Fitzroy Barrage impoundment.
- (At this site, being the Barrage) 65 nests were located during the 2004 breeding season, 31 during the 2005 season and 31 during the 2006 season. Two nests only were located at the Cardowan irrigation pool examined in 2005.

With respect to distributional limits the EIS also noted the relationship between Fitzroy River turtle and riffles with respect to feeding, noting that riffles in the proposed inundation area are highly ephemeral - limiting the time they are available for foraging. While it is recognised that riffles are not essential habitat for the species, along with the decreasing size and permanence of watercourses with distance upstream and scientific literature on the habitat attributes of this species, it was concluded that this made the overall habitat sub-optimal, particularly with respect to the ability of turtles to store energy for the breeding season by feeding in riffles when they existed, as suggested by Limpus et al. This would probably lead to low population densities.

13.1.2. Mitigation strategies

When assessing impact the EIS noted that Fitzroy River turtle have been found in shallow weir pools in the Fitzroy catchment (at Theodore, Neville Hewitt and Fitzroy Barrage; Limpus *et al.* 2007 p163) and would likely utilise the shallow edges of the Connors River Dam. The EIS conclusion concurs with Limpus (p173) that "impounded habitat, like natural, slow flowing, large pools, can be expected to have a lower carrying capacity for the species than would have been possible within the unflooded riffle zone(s)". Page 13-39 of the EIS also noted a key mitigation measure in relation to this potential use of the storage margins which would benefit Fitzroy River turtle; "The dam will provide less diversity of physical habitat, hence it is important to re-create some through the proposed strategies of snags placed in relatively (<5 m) shallow water and not clearing to FSL to provide structural diversity." Snag tangles are critical habitat for the species, as noted in Limpus *et al.* (2007).

With respect to the utility of fish transfer devices for turtles, the EIS noted "With respect to turtle movement, fishways have traditionally been less successful in providing adequate passage for turtles, which move within rivers to access feeding and / or breeding habitat (Section 13.1.3.4 of the EIS). Turtles prefer to walk upstream rather than use fishways and are unlikely to use the fishway in significant numbers. Fish locks can also be detrimental to turtles if they drown or become trapped in the hydraulic mechanisms of the lock, as has been observed at the Ned Churchward Weir fish lock (EPA 2004). The fishway and the spillway stilling basin will be designed with the aim of maximising potential movement while reducing the potential for physical damage. DERM turtle experts will be consulted early in this phase to ensure maximum potential benefits are identified and achieved".

With respect to spillway impacts the EIS noted "Turtles are the animals most likely to be near the spillway, and suffer mortality as a result of going over the spillway. However, the aquatic habitat near the dam wall will likely be less utilised by turtles due to the depth of the water".

With respect to mitigation measures a submission was critical of the EIS because “At present there is only a commitment to consult with DERM on the most suitable turtle transfer device. This is inadequate.” While the comment is incorrect, unfortunately the mitigation strategies of benefit to Fitzroy River turtles were not clearly presented in one place within the EIS. For example page 45 of Chapter 13 of the EIS stated; “Environmental strategies already included in the Project design, such as placement of snags within the shallower areas of the storage and maintaining trees along riparian areas will assist to provide suitable habitat for the species on the perimeter of the dam. Other strategies relate to the detailed design of the fishway and the spillway stilling basin so that potential for movement can be maximised while the likelihood of physical damage is minimised. DERM turtle experts should be consulted early in this phase to ensure maximum benefits are achieved.”

Hence there are three other mitigation strategies directed at improving the habitat within the storage for Fitzroy River turtle or minimising potential impacts related to physical damage. It should also be noted that the spillway design has now been changed from the proposed stepped spillway to a smooth face, as this is believed to be less likely to cause physical damage to turtles and other fauna.

There are also a number of strategies related to the downstream flow regime. Section 13.2.1.2 of the EIS commented on the proposed operational flow regime and its potential impact on fauna, including turtles. “With the dam in place these large flow pulses will continue largely unchanged (Figure 14-4). The long periods of zero flow will continue to occur, reflecting the naturally ephemeral nature of the Connors River. The slight over compensation will increase the depth of low flows over riffle zones downstream of the dam. These low flows will also help contribute to maintaining water quality within the deeper pools which, during zero flows will become a refuge for both fish and turtles.” Hence the deliberate over-compensation of low flows is a direct benefit to turtles by maintaining riffles and refuge areas.

Changes to the flooding regime downstream of the dam have the potential to create both negative and positive impacts for Fitzroy River turtle. Reduction in the number and frequency of floods during spring and early summer will reduce the natural loss of nests but the same reduction in flows may also potentially allow vegetation to establish on the nesting banks and prevent their natural rejuvenation. The relatively small size of the dam means the large flows will still pass the dam on a generally annual basis and provide sand bar rejuvenation (Section14.2.2 of the EIS). It is the timing of when the changes to the flow regime occur relative to the nesting and hatching periods of the turtle which is of particular interest. The Fitzroy River turtle lays eggs mainly in September/October and they mainly hatch in December/January. Major flood flows in the Connors River tend to occur between December and March while short term storm related events tend to occur in spring. It is the earlier of these floods that the dam is most likely to capture hence it will reduce the likelihood of floods impacting downstream nesting and nests. It will spill most often due to the later flood events (because it filled on the earlier ones) so rejuvenation of sand bars will tend to occur after hatching proportionally more often than it does now. While coincidental, the result is interpreted as a nett benefit to the species.

For locations further downstream Section 14.2.2.3 of the EIS showed that at the WRP compliance nodes the first post winter flow and medium to high flows were all maintained well above the mandatory targets.

The flow level of the first post winter flow event is such that it only effects the lower levels of sand banks so is unlikely to impact on nests but it will improve water quality.

Mitigation strategies related to the impacts of habitat change, imposition of a barrier and flow regime change were developed in the EIS and are presented below. While the EIS noted that details would be developed through consultation with DERM turtle experts, the list below has incorporated commitments already made in the EIS as well as items based on previous advice from Limpus, a DERM turtle expert. SunWater is committed to continue consultation with DERM, Fisheries Queensland and SEWPAC in regards to the mitigation measures proposed. The mitigation strategies are:

- Capture and translocation of fauna within the construction footprint prior to works commencing (noted in Section 12.3.1 of the EIS).
- Provision for aquatic fauna passage at all temporary and permanent watercourse crossings.
- Provide snag habitat in shallow areas on the edge of the storage and in in-flowing tributaries by not clearing within 1.5 m vertical of FSL and through placement of snags salvaged during clearing of the impoundment area (noted in several Sections of the EIS including 13.2.1.1).
- Replace the originally proposed stepped spillway with a smooth spillway.
- Design and orientate screens and filters on intakes to prevent turtles being attracted to the intakes and trapped (Intake screens noted in Section 2.3.1.7 of the EIS).
- Reduce mortality and injury to turtles during passage over impoundment structures during over-topping events by providing a 'soft landing' e.g. a deep pool (A stilling basin is described in Section 2.3.1.6 of the EIS).
- Reduce death and injury of turtles aggregated at or within the downstream side of outlet structures by reducing the velocity of high volume water release events and excluding turtles from outlet structures that produce high velocities (Cone dispersion valves noted in Section 2.3.1.8 of the EIS and detailed design will include specific exclusion devices. These discussions with DERM have commenced).
- Discourage turtles from climbing unsafe locations on impoundments by having an overhanging, smooth surface at least 1m high immediately above the downstream water level at all times.
- Increase in the rate of release of water from outlet structures gradually in order to prevent physical damage to turtles (outlet works that provide flexible options for environmental flow release are described in Section 2.1, page 2-14 of the EIS).
- Restrict the stocking of fish which prey upon turtles (particularly hatchlings) in the impoundment (This is SunWater's preferred position but stocking is controlled by DEEDI).
- Reduce the incidence of death and injury to turtles from boat strike, propeller cuts and fishing activities. (SunWater will provide informational signage at the boat ramp).
- Maintain flows downstream that 'mimic' the natural characteristics, particularly the post winter and summer flows (Conformance with the first post winter flow event is shown in Table 14-26 and 14-27. Conformance with all other Environmental Flow Objectives is shown in Tables 14-25 to 14-30 inclusive).
- Ensure permanent water holes that acted as refuges during no and low flows before the impoundment do not dry out as a result of the regulation of flows (Chapter 14 shows that baseflows are maintained and slightly overcompensated).

- Manage terrestrial and aquatic weeds to prevent them from blocking access to suitable nesting habitat for turtles (Terrestrial weed management is addressed in Section 10.2.1.4 while aquatic weed management is addressed in Section 12.2.1.2, page 12-24).
- Monitor the changes in nesting banks downstream from infrastructures and, where necessary, rehabilitate nesting banks that have not rejuvenated as a result of reduced flood flows (SunWater commits to sponsor this monitoring and rehabilitation (the latter if shown to be necessary), at the known nesting area at Cardowan and any other significant nesting banks found between the dam and Cardowan).
- Manage riverine sand mining so that it does not negatively impact on turtle nesting banks (The project does not propose sand mining in the Connors River, but it does propose sand extraction from the dry bed of tributary streams which contain no suitable habitat for these turtles).
- Manage the terrestrial zone around the impoundment to reduce loss of turtle eggs from predation by feral and native animals and avoid damage to nesting habitat from trampling by stock to increase nesting opportunities and the recruitment of hatchlings into the river (the project includes management of much of the dam catchment for environmental offset purposes. This includes reduced grazing and management of the offset areas to control weeds and feral animals).

SunWater believes that the EIS conclusions regarding the likely local population were valid and are supported by Limpus *et al.* (2007). A further survey has since been undertaken during a period of better water clarity which allowed snorkelling, spotlighting and the use of underwater video. The survey has confirmed the presence of Fitzroy River Turtle within the proposed inundation area and downstream but not upstream, though suitable habitat was identified upstream on some tributaries. The survey report is attached as Appendix D-6. The results support the assessment within the EIS, that is, that the species was likely present and that the inundation area is near the upstream limit of distribution of the species. The catchment above the dam represents less than 1% of the Fitzroy catchment and the riverine environments represents approximately 1.7% of the length of river from its commencement to the mouth of the Fitzroy (so not including the length of any other Fitzroy tributaries).

It is difficult to compare data from this survey with results from Limpus *et al* (2007) with respect to catch per unit effort (CPU) because of the different methods employed. The CPU from the current survey (including captures and sightings from all methods) was between .11 and .67 turtles per hour with one site downstream of the proposed dam recording a CPU of 2.0. Limpus reported a CPU from just dip netting at Cardowan of 2.7 but also noted 32 sightings during the same period. This may suggest that as the population nears its upstream limit of distribution the suitability of habitat decreases, along with the population density. This would logically be the case because eventually the streams become totally unsuitable. As a result of the turtle being present, the mitigation strategies put forward in the EIS remain valid and necessary.

In summary, once the above strategies are implemented SunWater suggests that while impacts to Fitzroy River turtle are certain, based on the relatively small proportion of its range which is impacted and the likely decreasing suitability of habitat as one progresses upstream, the impact on the catchments population will be minor. The habitat value of the storage itself will be maximised by the proposed mitigation strategies and the value of the catchment upstream will be improved by the Projects environmental offset strategy. Downstream flow regime impacts can be effectively mitigated by adherence to the environmental flow objectives of the water resource

plan and by slightly overcompensating the baseflow range. SunWater suggests that the residual impacts are low (minor) and acceptable.

SunWater commits to monitor the impacts and the effectiveness of mitigation strategies. Final design of the monitoring program will be developed in consultation with DERM and SEWPAC. Monitoring will include:

- Recording the sex and number of individuals moved, and where they were moved to, during translocation from the construction area (most appropriate relocation sites will be confirmed with DERM turtle experts). Individuals will be pit tagged using DERM approved techniques.
- Annual population surveys will be undertaken during the nesting season in each tributary upstream of the inundation area which supports suitable habitat, within the inundation area and downstream as far as Cardowan to assess the population and the likelihood of nesting (using non-invasive ultrasound techniques). All individuals captured will be pit tagged. Results will be assessed with respect to the monitored flow regime, dam water levels, fishway evaluations and changes over time.
- If nesting is observed within the dam catchment, the nests will be protected from predators using mesh cages (as used in the Fitzroy Barrage and Mary River) and the site will be inspected for evidence of hatching at the appropriate time.
- Use of the fishway and any other specific turtle movement process will be monitored and reported.
- Offtakes, outlet structures and the spillway will be inspected for evidence of injury or death caused to turtles and any such observations will be reported to DERM. If evidence suggests that design of the screens, stilling basin or outlet structures can be improved to avoid or minimise such instances, feasible and practical modifications will be undertaken as a corrective action.

There is a general belief that traditional fish transfer devices do not adequately cater for turtles. However the most recent monitoring data from Paradise Dam on the Burnett River (QPIF 2009) shows that the upstream fishway is catering for significant numbers of some turtle species. The current upstream design proposed for Connors River Dam is based on the Paradise design but will operate from minimum operating volume and over a wider flow range. The current downstream design has been refined based on input from DERM. SunWater commits to develop a transfer strategy for Connors River Dam in conjunction with turtle experts which maximises the likelihood of successful turtle movement. The transfer device will include pit tag readers to easily monitor turtle movement.

While it is considered very likely that effective transfer will result from the design process outlined above, SunWater suggests that if monitoring shows this is not the case, effective short term transfer and genetic mixing could be achieved by simple catch and carry techniques. SunWater is not aware of any such existing program but it is well established from field studies that turtles can be safely captured and transported. Success of any transfer mechanism also depends on utilisation of the habitat and successful breeding / recruitment. The likely success of catch and carry in this regard would be no different or higher than if the turtles moved by a dedicated fauna transfer device. The reason is that in the case of the latter the turtles enter the dam (going upstream) in a single location whereas the catch and carry approach can place them in selected suitable areas anywhere within the storage or its catchment. If the reason for the transfer was genetic mixing, then only a few males would need to be moved. The technique can also be used for other turtle species. There is a risk that because the movement

technique is active, as opposed to the passive technique of the fishway, that the turtles which are moved were not actually trying to move. This small risk is unlikely to outweigh the benefits of moving at a time when the fishway was not operating successfully, which is the only time it would be employed.

In the longer term the results from SunWater sponsored programs noted below could be incorporated into the modification of turtle transfer devices, if required. To be clear, SunWater does not anticipate that such actions will be necessary but is committing to the long term success of turtle movement processes at Connors River Dam and is prepared to undertake the necessary actions to ensure that success.

As a result of a residual minor impact on the species, SunWater offers an environmental offset. The direct offset for this Project is suggested as protection and management of sections of river and riparian zone downstream from the dam which are known (or may be confirmed in the future) to support the species. This 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 environmental offset strategy for the project includes the need to find and secure suitable Order 5 stream watercourse vegetation and SunWater aims to achieve this in the area immediately downstream from the dam as far as possible. This will be of direct benefit to the Fitzroy River turtle and the aim is to co-locate these offsets.

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 not specific to Fitzroy River Turtles but it will be undertaken in the Fitzroy catchment. It is envisaged that an existing weir which currently has no facility for passage will be fitted with alternative designs and the designs 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 described 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. It is

highly likely that the species occupies this length of river because it is known to exist both upstream and downstream and only two sites have historically been sampled in this long stretch of river. 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 the "Biodiversity and Vegetation" component of the existing Fitzroy Basin Association 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 if protection by volunteers is not undertaken.

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".

13.2. Fish species diversity

The statement in Section 13.2.1.2 of the EIS that diversity within the storage area may increase is withdrawn though it should be clarified that the statement did not use the word "natural".

13.3. Transfer of exotic flora and fauna species

It is acknowledged that there is risk of transfer of exotic fish species into the water storage area on boats using the storage, when used as live bait by fishers or simply through release of aquarium fish into the storage by members of the public. The risk associated with colonisation of exotic flora was assessed as high while that by fauna was assessed as low. The difference primarily related to the likely viability of transferred plants (seed or fragments of plants which can reproduce vegetatively) as opposed to fish (needing whole live fish to be transferred and needing a mate). However as the catchment is currently free of pest fauna and with very limited introduced aquatic flora, the EMP will be amended to strengthen the surveillance but also to include educational signage at the dam to encourage thoughtful usage (Section 29.1.1). It must be noted that it is practically impossible to stop deliberate release of aquarium specimens or use of introduced fish species as live bait, despite these activities being illegal.

13.4. Clearing of vegetation within the water storage

The degree of clearing proposed to be undertaken in the water storage area is a compromise between a number of factors including maximising the use of a valuable natural resource (millable timber, mulch etc.), minimising potential impacts of rotting vegetation on water quality within the storage, minimising erosion, providing habitat for flora and fauna and ensuring safe recreational use of the facility. The EIS noted that while trees would not be cleared within 1.5 m vertical of FSL, snags would be salvaged and placed to depths of up to 5 m. This is in recognition of both the use of water of this depth by turtles and a number of fish but also that water levels in storage would sometimes reduce below 1.5 m.

13.5. Diversion channel

The diversion channel was not designed to exclude fish and the EIS committed to include some physical structure with the aim that it may provide rest areas for any fauna which used the channel as a movement conduit.

13.6. Impact of the waterway barrier

That the dam wall constituted a barrier to movement of aquatic fauna was clearly acknowledged in the EIS. As a headwater dam, the barrier effect of Connors River Dam will be less than that of a more downstream dam as it is beyond the migratory limits of many species and in an unmitigated scenario it isolates a relatively small proportion of the available habitat. The length of the Connors River upstream of the dam represents the uppermost 1.7% of the length from the commencement of the Connors River through the Isaac River, Mackenzie River and Fitzroy River to the mouth of the Fitzroy. The catchment area above the dam represents less than 1% of the Fitzroy catchment (1284 km^2 cf 142,600 km^2). It also represents 5.7% of the Isaac Connors sub-catchment. The length of river between Tartrus Weir (the nearest man-made downstream barrier) and the commencement of the Connors River (which is within the proposed water storage) will be reduced by 6.3%. In the natural scenario, opportunities for movement past the area of the dam are limited by the flow regime which often sees the river reduced to a series of disconnected pools (Section 14.2.2.2 of the EIS).

Despite the relatively small area of catchment and length of stream isolated, because the aquatic fauna captured within the upstream catchment was entirely native and diverse, it is important that connectivity is maintained. The project therefore includes a fish transfer device that will be designed using the best available information and will aim to minimise the disruption to movement. It was acknowledged in the EIS that a fish transfer device is unlikely to provide the same efficiency of movement as would be the natural case. Opportunity was maximised by ensuring the device could operate from Minimum Operating Volume (that is, from when the dam is nearly empty) through to when the dam was spilling. Opportunity in the low flow range was overcompensated meaning fauna would be able to pass the dam when the drying river would naturally have provided barriers.

The rock bar upon which the baseflow and fishway release strategy was based is the only known instream barrier of any significance in the area potentially affected by flow regime change downstream of the dam. Drown-out occurs at low flows so the change in medium to high flows makes negligible if any difference to connectivity. All medium to high flows are maintained above target values in the WRP.

The ability to vary attractant flows as river flows vary was noted on page 13-42 of the EIS. This will allow "banking" of flows for later block release. The detailed strategy will be developed during detailed design of the fish transfer device.

13.7. Minimal and acceptable impacts

These words were used in Section 13.3 of the EIS as a summary of the potential cumulative impact of proposed new water infrastructure in the Fitzroy catchment. They were prefaced by an assumption that the infrastructure would be operated to provide ecologically critical environmental flows and would be fitted with effective fishways. The discussion in the preceding sections addressed the commonness or rarity of the species impacted and their abilities to survive in the altered environments. The text noted that changes for some habitat specialists could be significant. These impacts will be further addressed through the respective impact assessment processes related to the other proposed water infrastructure projects in the Fitzroy. The conclusion solely with respect to the Connors River Dam and pipelines project was that impacts could be effectively managed and the residual risks were acceptable. This was based on an assessment of the fauna as widespread and common with generally broad environmental tolerances. The footprint of impact was relatively small compared to that available in the Isaac Connors sub-catchment. Hence while a range of impacts were identified, mitigation strategies were applied to each and reduced the impact to low levels.

14. SURFACE WATER

The following key issues were raised by submitters in relation to the Surface Water section of the EIS:

- Provision of town water supplies;
- Operational strategy, particularly in relation to medium flows;
- Reporting of water allocation security objectives (WASOs);
- Climate change terminology; and
- Level of service assessment.

14.1. Flood margin and land acquisition

The relationship between the adopted flood margin (1 in 100 year AEP event) and land acquisition was described in Section 2.2.1 and Section 7.2.1.2 of the EIS. Those sections noted that SunWater would own land to the flood margin and not allow inappropriate development in that area. The margin is also used to assist in the determination of the extent of impact on a property and if full purchase should be considered as opposed to partial purchase.

14.2. Stream crossing designs

Advice will be sought from Fisheries Queensland during the detailed design phase regarding all stream crossings including haul roads, causeways, culvert crossings, etc. unless crossings are constructed according to the relevant self assessable code under the Fisheries Act (1994).

14.3. Fishway release flows

As discussed in section 14.2.2 of the EIS, the fishway is intended to mimic natural fish movement opportunity times and will be operated when flows naturally occur. Whenever inflows to the dam occur fishway attraction flows will be made and the fishway will operate. Downstream orders and other environmental releases can also be used to operate the fishway. Preliminary investigations have not included an allowance for two fishways to operate on this structure, though the single fishway will operate in both upstream and downstream directions.

It has been suggested that the volume and timing of releases should be considered further and that it may be possible to 'bank' some water for future releases. This will be discussed with Fisheries Queensland, as the detailed design and operation of the fishway is refined throughout the project.

14.4. Modification of flow regime

The dam's impact on the existing downstream flow regime, the impact to river connectivity and potential impacts to existing water users were discussed in section 14.2.2.2 of the EIS, which concluded that the impacts from the dam would primarily be restricted to the reach directly downstream of the dam to the Funnel Creek confluence. Beyond this point the impacts decrease with distance from the dam, due to the inflow from tributaries and other watercourses (Figures in section 14.2.2.2 of the EIS).

River connectivity downstream of the dam will be maintained at its current level in the low flow range. This is primarily achieved through the dam low flow release, which releases inflows to the dam up to a maximum flow of 55 ML/d (Section 14.2.2.1 of the EIS).

A natural rock bar exists approximately 4.5 km downstream of the dam and it restricts downstream flow and causes ponding up to the dam site. Hydraulic analysis of this site shows that a flow rate of 55 ML/d will provide greater than 0.3 m of flow above the rock bar. A depth of 0.3 m is generally acknowledged to provide stream connectivity and fish movement opportunity and has therefore been adopted as a measure of connectivity between the two river sections.

All medium to high flows are maintained above target values in the WRP. Tables 14-26 to 14-30 show that all medium to high flow criteria, including the first post winter flow, are maintained well above the WRP mandatory values.

It was acknowledged in the EIS that the dam has the potential to impact on existing water users, particularly water harvesters. A preliminary compensation strategy was developed as part of the EIS modelling, this aimed to maintain the existing levels of mean annual diversions. It was acknowledged that these strategies were preliminary and may change during later stages of the Project. It is anticipated that final compensation strategies will be developed in consultation with the appropriate irrigator groups.

14.5. Water Allocation Security Objectives

The DERM submission raised the question of the accuracy of the EIS reporting on water allocation security objectives (WASOs) (Sections 14.1.6.2 and 14.2.2.3 of the EIS).

The WRP specifies WASOs for the following groups:

- Supplemented Water – high priority and medium priority water
- Unsupplemented Water in the Nogoa Mackenzie Water Management Area, the Fitzroy Water Management Area and sections of the Dawson River and the Comet River.

There are three performance indicators specified for unsupplemented water, these focus on the number of days of water harvesting opportunity, as follows:

- 30th Percentile Year – the number of days that water would have been taken in the 30th percentile wettest year in the simulation period (for a given site, purpose and flow conditions);
- 50th Percentile Year – the number of days that water would have been taken in the 50th percentile wettest year in the simulation period (for a given site, purpose and flow conditions);
- 75th Percentile Year – the number of days that water would have been taken in the 75th percentile wettest year in the simulation period (for a given site, purpose and flow conditions).

The minimum number of days of water harvesting opportunity is specified in the WRP for the 30th, 50th and 75th percentile years.

Three waterharvesters were incorrectly included in the reporting of the unsupplemented WASO on the Nogoa Mackenzie (tables 14-19 and 14-32) due to the adoption of established reporting protocols. These waterharvesters are actually located on unregulated tributaries and should not have been included in the reporting. The removal of these waterharvesters from the reporting means that the Nogoa Mackenzie Unsupplemented WASO is compliant for all water harvesters and for all performance indicators for the Full Entitlement, With Dam and Cumulative Impacts scenarios. Also, one waterharvester was mistakenly reported against the incorrect objectives.

DERM have also suggested that the reporting tables be modified to better reflect the licence classes on the Nogoa Mackenzie. Tables 14-19 and 14-32 of the EIS are therefore presented below, with the changes described above.

Updated Table 14-19 Mandatory unsupplemented WASO: days of waterharvesting opportunity (Nogoa Mackenzie) – Full Entitlement Scenario

Unsupplemented Irrigator Groups	WRP Objectives			Full Entitlement Scenario		
	30th Percentile Year	50th Percentile Year	70th Percentile Year	30th Percentile Year	50th Percentile Year	70th Percentile Year
Class 1A	26	24	20	26	26	26
				26	26	26
				26	26	26
				26	26	26
Class 1B	23	21	15	23	23	23
				23	23	23
Class 4C	80	70	60	87	81	72

Updated Table 14-32 Mandatory unsupplemented WASO: days of waterharvesting opportunity (Nogoa Mackenzie) – Full Entitlement & With Dam Scenarios

Unsupplemented Irrigator Groups	WRP Objectives			Full Entitlement Scenario			With Dam Scenario		
	30th Percentile Year	50th Percentile Year	70th Percentile Year	30th Percentile Year	50th Percentile Year	70th Percentile Year	30th Percentile Year	50th Percentile Year	70th Percentile Year
Class 1A	26	24	20	26	26	26	26	26	26
				26	26	26	26	26	26
				26	26	26	26	26	26
				26	26	26	26	26	26
Class 1B	23	21	15	23	23	23	23	23	23
				23	23	23	23	23	23
Class 4C	80	70	60	87	81	72	87	81	72

Although WASOs are not specified for unsupplemented users in the Isaac Connors catchment reporting was made against their modelled mean annual diversions in order to allow an assessment of the level of impact from the dam operations. This reporting was not intended to imply compliance/non-compliance with the WRP.

In the EIS the performance indicator for high priority water was described as > 95% median monthly reliability, this should have been 95-100%.

Table 14-18 in the EIS listed existing high priority water use in the Isaac Connors catchment. These users should not have been reported as they are outside of existing water supply schemes and therefore do not have specified WRP security objectives. Table 14-18 should therefore have been presented in accordance with the following table.

Updated Table 14-18 Mandatory medium and high priority WASOs

	Median Monthly Reliability (%)	Full Entitlement Scenario (%)
Nogoa Mackenzie		
High Priority	95 - 100	100.0
Medium Priority	82 - 88	93.6
Lower Fitzroy		
High Priority	95 - 100	99.5
Medium Priority	82 - 88	97.0

A question was raised regarding the column label “Full Entitlement” in Table 14-21. This refers to results from the modelled “Full Entitlement” scenario, as described in section 14.1.2.2 of the EIS.

14.6. Additional water held in reserve in the Isaac Connors catchment

The DERM submission raised the question of the impact of the Connors River Dam on additional water held in reserve for future development in the Isaac Connors catchment. This reserve was not included in the original EIS modelling for two reasons. Firstly, the water held in reserve is not specified for a particular project, purpose or location. It has previously been modelled by DERM as a large waterharvester at the end of the Connors River and included an allowance for the development of the Connors River Dam. This modelling provided no clear indication as to the volume or location of the residual reserve once the Connors River Dam was in place.

Secondly, the modelling completed for the EIS was intended to assess the hydrologic regime and water use in the Fitzroy River system prior to the construction of the dam and then once the dam was operational. The two cases are intended to allow a direct comparison of the impact of one change only, i.e. the operation of the dam. The inclusion of the reserve would not have allowed assessment of the specific impact of the dam as required by the EIS Terms of Reference.

Additionally, DERM commented that the waterharvesters on the Nogoa Mackenzie, downstream of the Isaac River confluence, should be benchmarked and reported against their performance under the original reserve scenario. This would serve to indicate whether compensation (as discussed in the EIS) was required, given the allowance for further development in the catchment.

In order to assess the potential change to the Isaac Connors reserve and the Nogoa Mackenzie waterharvesters, additional modelling was undertaken. Three scenarios were modelled, allowing for a reservation of 5,000 ML/a, 10,000 ML/a or 40,000 ML/a in the Lower Isaac River. These scenarios included the Connors River Dam, with the operational strategy as described in the EIS but without the preliminary compensation strategy for the Nogoa Mackenzie waterharvesters.

The following results were found for all scenarios investigated:

- The waterharvesters on the Nogoa Mackenzie, downstream of the Isaac River confluence, showed a minor reduction in mean annual diversions (< 2%) but all were compliant with their specified WASOs;
- All mandatory WASOs below the Connors River Dam in the Nogoa Mackenzie and Lower Fitzroy rivers are met;
- All mandatory EFOs below the Connors River Dam in the Nogoa Mackenzie and Lower Fitzroy rivers are met.

It should be noted that this modelling presents possible future water use development options, accessed through water held in reserve. These are by no means the only development options available.

14.7. Fitzroy Basin Water Resource Plan review

The review of the Fitzroy Basin Water Resource Plan (WRP) was acknowledged in section 14.2.2 of the EIS.

At this point in time it is expected that the new WRP will be finalised in 2011. The proponent intends to review the preliminary operational strategy in light of the new WRP when this becomes available.

14.8. Resource Operations Licence (ROL)

The interference of flows in Connors River and the operation of the Connors River Dam will be managed under a Resource Operations Licence (ROL), issued by DERM. This will relate to interference with flows throughout the project life, from construction through to long term operation. The licence will be amended over the period of the project to reflect changes in operation throughout the construction and operational phases.

It is assumed that the ROL will create a new water supply scheme in the Isaac Connors catchment, rather than extending an existing scheme.

14.9. Climate change modelling

A concern was raised that the discussion of the potential climate change impacts used the term “scenario” to describe the cases modelled using IQQM. It was pointed out that, with reference to climate change discussions, the term “scenario” is generally used to describe a particular future emissions situation, resulting from specific

levels of economic development, population growth and technological changes (see the *Special Report on Emissions Scenarios (SRES)* (IPCC, 2001) for more information).

The use of the word "scenario" to refer to both the climate change emissions scenarios (B2, A1B, A1FI, etc.) and the modelled percentiles (10^{th}, 50^{th} and 90^{th} percentiles) is unfortunate but it does not invalidate the information presented or impact on the understanding of the information presented.

14.10. Level of service assessment

As discussed in section 14.2.2.7 of the EIS the Level of Service (LOS) assessment was undertaken using the preliminary operational strategy under current climate conditions and potential climate change. This was intended to assist in understanding the adequacy of the level of service of the water supplies from the Connors River Dam, for urban and mining use.

DERM have commented that the use of the historic record for this assessment, rather than stochastic data, means that the LOS results are not conservative. Although stochastic data was not used for this assessment the climate change modelling was used and does provide an indication of the behaviour of the water supply under changed climatic conditions.

A LOS assessment is usually calculated based on critical levels in the dam and the frequency and duration of resulting water restrictions. While the preliminary operational strategy restricts environmental releases, compensation releases and the MP supply when the dam falls below 70,000 ML, it does not include any water supply restriction levels for the HP supply. As such, the LOS analysis presented in the EIS provided an assessment of the maximum extractions from the dam. Under water restrictions it is anticipated that the security of supply would be increased.

It is anticipated that a critical water supply strategy will be developed once the Project is commissioned. This would include water supply restrictions in order to manage the level of demand on the dam during drought periods.

15. GROUNDWATER

15.1. Groundwater dependant ecosystems

As discussed in Section 15.1.7 of the EIS, the EIS did not undertake any specific studies related to Groundwater Dependant Ecosystem's (GDE's). However, the EIS did conclude that risks to groundwater levels were low; hence risks to GDE's are also low. Furthermore, the EIS also suggested monitoring programs to ensure no impacts to groundwater levels occurred.

16. SURFACE WATER QUALITY

The following key issues were raised by submitters in relation to the EIS:

- Impacts to water quality during filling, first release and normal operation phases;
- The potential for stratification within the waterbody; and
- Impacts to downstream water quality during construction and operation.

16.1. Inundation area impacts

16.1.1. Filling phase

As outlined in Section 14.2.2.5 of the EIS, there is a 50% probability of reaching the high priority reserve trigger (70,000 ML) within 0.57 years and full storage volume within 1.47 years, not 2 years as suggested in the submission.

The risk of stratification for a waterbody is linked to the frequency and volume of inflows - during periods of high inflows, vertical mixing of the water column occurs preventing the formation of a thermocline (temperature gradient) and thus stratification. Also contributing to the risk of stratification is water depth – generally, as depth of the water column increase, vertical mixing decreases. The high rate and volume of expected inflows (Section 14 of the EIS), combined with the relatively shallow depth of water that would be expected throughout the majority of the filling period, are expected to provide strong vertical mixing of the dam. Consequently, the expected risk of stratification throughout the initial filling phase is low.

In the unlikely event that the water storage became stratified during the initial filling phase, impacts to water quality would be expected as stated in Section 16.2.1.2 of the EIS. Stratification would result in decreased water quality in the lower layer of a waterbody (hypolimnion), with this layer exhibiting low temperatures, low dissolved oxygen (DO) and high concentrations of metals. The proposed multi-level offtake will allow selection of the best quality water for release once the dam reaches minimum operating volume.

16.1.2. First release

SunWater will develop a first release strategy to minimise the risk of poor quality water impacting on environmental values downstream of the dam. This is likely to include monitoring water quality in the water storage and in the receiving environment downstream. In periods of high flow, it is likely that background water quality in receiving waters will exceed relevant guidelines (as it does now). It is often accepted that releasing poor quality water from the storage at this time will have minor incremental impact downstream but will greatly assist the attainment of suitable water quality in the storage in the shortest timeframe possible. Impact mitigation measures included in the Project (e.g. management of land use in the balance of acquired properties and remediation of potential contamination sources) will contribute to maintaining or improving water quality.

16.1.3. Normal operation

Section 16.2.1.3 of the EIS specifically outlines and details key issues related to the quality of water within the water storage area under normal operating conditions. Potential impacts upon water quality within the storage area under normal operating conditions are identified as:

- Increased nutrient concentrations (total nitrogen and total phosphorus);
- Increased turbidity levels;
- Stratification (including lowered dissolved oxygen concentration and water temperature);
- Seasonal overturning;
- Chemical cycling; and
- Sedimentation.

Possible sources of nutrients during operation will primarily occur from land use practices within the catchment and naturally occurring sedimentation (Section 16.2.1.3 of the EIS). Whilst high concentrations of nutrients (total nitrogen and total phosphorus) are predicted by modelling, discrimination between naturally high source areas or those resulting from anthropogenic influences is not possible (Section 16.2.1.3 of the EIS). The fact that SunWater aims to use parts of the catchment for 'environmental offset' (with limited grazing and significant re-forestation) suggests that historic sediment and nutrient runoff rate is likely to be higher than that will occur after construction (Section 16.2.1.3 of the EIS).

With the cooling of the upper levels of the dam turn-over events may occur in winter and have relatively short lived impacts and are subsequently of less concern to dam operators than stratification. Following a turn-over event, nutrients released from sediments in the lower anoxic (oxygen poor) waters are transported to the surface where they could potentially stimulate algal blooms. Additionally, immediately following a turn-over event, low dissolved oxygen concentrations may occur (although for very short periods of time). Based on experience of other storages in the region, turn-over events are not expected to occur frequently.

Hydrological analysis (Section 14 of the EIS) and evidence from other storages in the Fitzroy Basin (Section 16.1.4.2 of the EIS) suggest that strong stratification is not likely, except in periods of prolonged drought (Section 16.2.1.3 of the EIS). Such conditions might occur once in approximately 20 years on average. Stratification is an issue for water quality because when a water body stratifies, the bottom layer of water (hypolimnion) is likely to exhibit low temperatures, low DO concentrations and high concentrations of metals (Section 16.2.1.3 of the EIS).

As dissolved oxygen concentrations are closely linked to stratification, overturning, and mixing within impoundments (Section 16.2.1.3 of the EIS), it is expected that DO concentrations will vary seasonally, during wet and dry periods and according to water depth (Section 16.1.4.2 of the EIS).

Infill sedimentation rates are predicted to be very low – 0.05% of storage volume per year (Section 16.2.1.3 of the EIS).

All issues considered, under normal operating conditions water quality within the impoundment is expected to support healthy communities of aquatic flora and fauna (Section 13.2.1.2 of the EIS).

One potential impact of climate change on the project is an increase in the frequency and duration of drought as a result of decreased rainfall. The decrease is predicted to be between 2 and 10% over the next 60 years. How this translates into a stratification risk is difficult to predict because total runoff is less important than precisely when the runoff occurs in this regard. However given the low existing risk, the potential increase in risk is not

considered substantial. SunWater will monitor both climate and stratification and determine if any change does in fact occur with respect to the latter.

16.1.3.1. Stratification

Examination of historic flow data reveals that Awoonga Dam receives notably lower inflows than that of the proposed Connors River Dam site. As identified in the respondent's submission, the higher the frequency of flows - which cause mixing within the waterbody – the lower the risk of stratification. Accordingly, the risk of stratification at Awoonga Dam is considered to be higher than that of the proposed Connors River Dam site.

Blue-green algae data collected at Fairbairn Dam (the closest large dam to the proposed Connors River Dam site) indicates that blue-green algal blooms occur infrequently. From a total of 244 samples collected throughout the 2001 to 2010 period (usually on a fortnightly basis), only 5 (2.04%) exceeded the low hazard level of 20,000 cells/mL and 95.9% of samples recorded a biovolume of less than 2 mL/L.

The assessment of a moderate risk of stratification for the proposed Connors River Dam site is thus considered appropriate. No mitigation strategy related to in-storage management, beyond SunWater's present warning system, was detailed in the EIS because stratification in the proposed Connors River Dam was considered to be an infrequent, short-lived event.

The statement made in the respondent's submission that the EIS references Section 14 of the EIS "as a justification" for the calculation that stratification is only likely to occur once in every twenty years, is not correct. The reference to Section 14 of the EIS made in Section 16.2.1.3 is not a specific reference to the risk of stratification, it is a reference to the frequency of prolonged drought, which (as discussed in Section 16.1.1 of the Supplementary Report) due to reduced inflows (and the associated decline in vertical mixing of the waterbody caused by these inflows), is indirectly related to the risk of stratification.

The comment made in this same submission, that "it is noted from Figure 14.19 that the modelled dam levels suggest there are around 13 of the 29 years modelled where the dam did not spill", and suggesting that this also was in conflict with the likelihood of the dam stratifying about once in every twenty years, is also not correct. Figure 14-19 of the EIS is an example of prolonged drought and should not be taken as representative of the likely long-term frequency of such events. Figure 14-18 of the EIS places that period in context.

16.2. Downstream area impacts

16.2.1. Construction

Section 16.2.1.1 of the EIS specifically outlines the impact upon water quality expected as a result of construction of the dam, as well as mitigation measures employed to ensure this impact is minimised.

As outlined in Section 16.2.1.1 of the EIS, water flowing from the construction site following precipitation within the catchment could potentially have elevated turbidity and hydrocarbon contamination. Activities that may lead to increased turbidity (as listed in Section 16.2.1.1 of the EIS) include sand and gravel extraction, clearing of vegetation, excavation and earthworks, dewatering of foundations, temporary or permanent road construction and related drainage, wastewater from concrete batch plants, vehicle and equipment wash-down activities and

foundation clearing and grouting. Activities that may lead to hydrocarbon pollution (as listed in Section 16.2.1.1 of the EIS) include vehicle and equipment wash-down activities, equipment leaks, runoff from paved areas and accidents or spillage.

Mitigation measures employed to ensure potential impacts to downstream water quality are minimised are detailed in Section 16.2.1.1 of the EIS and include:

- Timing of construction (during the dry season as far as reasonably practicable);
- Diversion of the Connors River channel around the 'disturbed' construction zone;
- Deployment of floating booms supporting silt curtains downstream of the proposed dam; and,
- Directing all water used in the construction of the dam to sedimentation ponds prior to discharge.

In addition to these proposed measures, impacts associated with runoff and related erosion will be addressed by a Sediment and Erosion Control Plan and Waste Management Plans (Section's 6, 20 and 29 of the EIS) detailed in the Environmental Management Plan prior to construction (Section 2.5.1.14 of the EIS) and submitted to the relevant regulating authority as part of future applications for permits. The Sediment and Erosion Control Plan will be designed in accordance with guidelines such as International Erosion Control Association (IECA) Australasia 2008 (an internationally recognised standard) to significantly reduce potential for additional sediment to enter the watercourse.

Despite all mitigation measures, during times of high flow, when the capacity of the diversion channel is exceeded, elevated turbidity levels can be expected downstream of the proposed construction site (Section 13.2.1.1 of the EIS). As elevated turbidity levels are naturally high in local watercourses under such conditions, the potential impact upon water quality will likely be mitigated to some extent.

As outlined in Section 16.2.1.1 of the EIS, most construction works in and near the waterways will occur in the dry season. Although the site will be vulnerable to high rainfall events that occur in spring and summer, the construction sequence and timing has been designed to accommodate these events and minimise impacts to both constructed works and the environment (Section 16.2.1.1 of the EIS). Whilst it is noted that high flow events have historically occurred in this system throughout the normally dry months, it is noted that the occurrence of such events would be considered rare (Section 14.1.5.1 of the EIS). Considering the low frequency of major flooding events potentially occurring at the dam site, the risk of interruption during construction is considered acceptable.

Section 26 of the EIS assessed hazards and risks during dam construction. Risks to the works, the workforce and the environment associated with natural hazards, including storms and associated flooding, were recognised in Table 26.5 with mitigation provided in Table 26.8. Mitigation included various considerations during design plus awareness of approaching weather events. Section 26.6 recognised the need to incorporate response to storms in emergency planning.

16.2.2. Normal operation

As stated in Section 2.3.1.7 of the EIS, featured in the design of the proposed dam will be a 'single multi-level withdrawal system'. The selective withdrawal system, providing for both downstream and pipeline release,

consists of a series of baulks which can be removed to allow water to flow from the required level. Multi-level off-takes enable flexibility when water quality differs vertically through the water column as may occur under normal conditions, when the dam is stratified or in the short term after a turn-over event.

As discussed in Section 16.2.1.6 of the EIS, use of this multi-level off-take system will allow dam operators to avoid accessing water of 'poor quality' for downstream and environmental flows, ensuring that the best quality water is released through the outlet works.

As outlined in Section 2.6.1.2 and Section 14.1.1 of the EIS, to ensure all Environmental Value's are met, all release's made from the dam must be made in accordance with requirements specified in the Water Resource (Fitzroy Basin) Plan (1999) and the Fitzroy Basin Resource Operation Plan (ROP) 2006 (discussed in detail in Section 14).

The purpose of Section 16 of the EIS is to identify and examine all of the potential environmental impacts associated with the construction and operation of the proposed dam, in accordance with Section 3.4 of the ToR provided by the Coordinator-General. Coal mines which take water from the Project obtain approvals via standard processes and operate under the conditions of those approvals. SunWater assumes suitable conditions will be imposed with respect to the treatment and release of any water used by the mine. Potential impacts of water used by irrigated agriculture were addressed in Section 16.2.1.8 and in Section 27.3.2.2 from a cumulative impact perspective.

16.2.3. Drinking water

SunWater will be providing raw water for a range of potential purposes. It is the responsibility of the water purchaser to treat it, if necessary, to be fit for purpose. SunWater will monitor water quality at the offtake and make that data available to users. A process will be established to warn users of any major change to raw water quality, such as a blue-green algal bloom. Urban supplies in the region are currently drawn from groundwater with limited surface water supply. It is treated at local council facilities prior to distribution. It is extremely unlikely that raw water provided from the dam would be of lower standard or require any significantly different treatment from that currently undertaken.

17. AIR QUALITY

No issues were raised with respect to this section.

18. GREENHOUSE GAS EMISSIONS

18.1. Operation

The assessment of emissions from rotting submerged vegetation (and submerged soil) was determined using the 2006 IPCC Guidelines for National Greenhouse Gas Emissions and was discussed in Section 18.3.2 of the EIS with the emissions factors shown in Table 18-3 of the EIS. The submitter did not suggest an alternative approach.

18.2. Mitigation measures

Section 18.4 of the EIS describes the mitigation measures proposed as part of the Project in relation to greenhouse gas emissions. It should be noted that refinement of the pumping arrangements for the pipeline have led to a reduction in predicted greenhouse gas emissions during the operations phase and further refinement through the design process aims to again improve the result.

19. NOISE AND VIBRATION

No issues were raised with respect to this section.

20. WASTE

No issues were raised with respect to this section.

21. TRANSPORT

The following key issues were raised by submitters in relation to the EIS:

- Potential for additional impacts to local police and emergency services;
- Impacts to localised traffic during construction; and
- Provision of additional detail regarding access and route changes within the Project area.

21.1. Regulatory framework

It is noted that the *Transport Infrastructure Act 1994* (TI Act) is administered by the Department of Transport and Main Roads and not the Environmental Protection Agency or port authorities.

The TI Act is the relevant State legislation concerning the management of transport infrastructure including roads and railways. Where construction and/or maintenance access to State controlled roads are required, approvals are to be obtained under *section 62* of the TI Act and construction approval under *section 33* of the TI Act. When construction access to a rail corridor is required, an approval from QR Network Pty Ltd (QR) limited is required in the form of a Wayleave agreement.

21.2. Transport methods and routes

The 2007 data was the latest publicly available data from the DTMR Census at the time of writing the EIS. Traffic volumes are anticipated to grow rapidly within the region as a result of significant mining projects. Additional traffic assessments will therefore not be undertaken until just prior to the detailed design phase. This will provide a definitive indication of traffic volumes both impacted and produced as a result of the Project.

21.2.1. Police and emergency services

As discussed in Section 21.3.3 of the EIS, while the potential impacts on health and emergency services is expected to be minimal with no significant increases on services required, ongoing consultation with Queensland Police Service (QPS), Queensland Fire and Rescue Service (QFRS) and Queensland Health will be undertaken to ensure that services are able to accommodate the Project and any associated impacts are addressed.

SunWater will include provisions for facilitating communications with emergency services in detailed Traffic Management Plans (TMPs). This will be done in conjunction with QPS as a key stakeholder along with DTMR and Isaac Regional Council.

SunWater acknowledge that in the event of a major emergency incident, local ambulance resources would be activated in accordance with local disaster management procedures and in consultation with key stakeholders.

21.3. Potential impacts and mitigation measures

21.3.1. Roads

As discussed in Section 21.4.1.5 of the EIS there may be localised traffic disruption associated with constructing the pipeline within or in the vicinity of a road corridor. This work would mainly be on new access tracks within the pipeline and road crossings. Suitable controls will be implemented in consultation with DTMR and/or Council as

appropriate prior to the commencement of these works. This includes controls for the operation and maintenance of the water pipeline and any associated infrastructure.

21.3.2. Construction traffic

21.3.2.1. Access and Routes

Section 21.4.1.1 of the EIS stated that improvements to the Connors River Collaroy Road will include construction of the Marlborough Sarina Road/Connors River Collaroy Road intersection to the appropriate standards. While not explicitly stated, the upgrade requirements will be assessed by a Registered Professional Engineer (RPEQ) and detailed in consultation with the regional DTMR office to cater for Project traffic. Documentation of the intersection upgrade will also be included in TMPs, which will be submitted to DTMR prior to the commencement of construction works.

The description of Area 6 within Table 21-4 of the EIS should be updated to read:

"Two alignments are under consideration. The preferred alignment is the southern option, which would run parallel to the Peak Downs Highway, crossing the Norwich Park Branch line south west of Coppabella until the road corridor crosses the Millennium pipeline. At this location the pipeline will cross the Peak Downs Highway. The alternative alignment is the pipeline crossing the Peak Downs Highway following the Braeside pipeline from 5 km west of Annandale, and then paralleling the Goonyella rail line via the Eungella pipeline to the Isaac River."

SunWater will liaise with Queensland Rail (QR) on the detailed design for crossing the line and the appropriate tenure options for such crossing. QR National has established points of contact for the process.

As discussed in section 21.4.1.5 of the EIS, any construction near or encroaching on, a road reserve will be agreed with the relevant authority and conform to statutory requirements. In addition, where there is anticipated to be vehicular conflicts with traffic associated with the Project and general traffic (in particular identified 'black spot' locations and travel through these by Project commuters), detailed TMPs complementing the Project Road Use Management Plan (RUMP), will be implemented as required. If the road is State controlled, an application for an Ancillary Works and Encroachment Permit will be made to DTMR. All relevant construction related permits will be obtained prior to the commencement of construction works.

21.3.2.2. Workforce and equipment and materials

Section 21.4.1 of the EIS includes off site transport operators or suppliers as part of the traffic and workforce composition. Estimated vehicle trips during dam and pipeline construction are provided in Table 21-5 and Table 21-6 of the EIS respectively. The number of drivers is equivalent to the number of vehicles in the categories of "construction material and equipment" and "service vehicles" in those tables. They were thus taken into account in the trip generation data. During the pre-construction phase Camp 1 will be available for drivers primarily delivering to the dam site or the eastern end of the pipeline (approximately Areas 1-3). For deliveries in western areas of the pipeline which may occur prior to construction of camps 2 and 3, existing accommodation such as the Mac camp in Nebo would be the preferred accommodation. Once the camps are established, drivers could stay at the camps.

The peak transportation activity has been identified in Section 21.4.1.4 of the EIS as during pipe line bedding material delivery (and stockpiling) concurrent with the delivery of pipes. The traffic routes, composition and impacts of the peak transportation activity have been assessed in accordance with *Guidelines for Assessment of Road impacts of Development (GARID)* requirements in Section 21.4.1 of the EIS, which includes proposed workforce accommodation provisions and their locations.

As discussed in Section 21.4.3 best practice mitigation measures to ensure minimisation of Project impacts will include consultation, negotiation and permitting conducted with DTMR on the movement of any oversized loads and/or dangerous goods identified during detailed design. All relevant haulage related permits will be obtained prior to the commencement of construction works. SunWater understands that submission of these permits are to be made to TMR a minimum of four weeks prior to the need to undertake the transport haulage task(s).

21.3.3. Mitigation measures

As stated in Section 21.4.3 of the EIS, specific mitigation measures will be determined during detailed design further to a review of the nominated transport strategy and routes and via consultation with DTMR and relevant authorities. The design and locations of temporary or permanent access from State controlled roads, as well as intersection/access upgrade requirements are inclusive of the specific mitigation measures. These will be documented in a revised Road Impact Assessment (RIA), which will be submitted to DTMR.

The detailed RIA will be prepared in accordance with the DTMR GARID and submitted to DTMR at least three months prior to the planned commencement of construction. The detailed RIA will identify likely generated equivalent standard axles (ESAs), road segments where 5% of baseline ESAs will be exceeded and the documentation of a pavement assessment as required.

Furthermore, as discussed in Section 21.4.3 best practice mitigation measures to ensure minimisation of Project impacts will include implementation of Road Use Management Plans (RUMPs) and associated TMPs. SunWater acknowledge that the TMPs will require the approval of both Isaac Regional Council and DTMR.

SunWater agrees that any construction within the road reserve will be performed by contractor(s) prequalified with DTMR. The specifics of design and construction requirements will be determined in detailed design, in consultation with DTMR.

The Proponent will provide maintenance to the satisfaction of the local authorities where it is shown that damage to roads has occurred as a result of Project related activities.

22. INDIGENOUS CULTURAL HERITAGE

No issues were raised with respect to this section.

23. NON INDIGENOUS CULTURAL HERITAGE

23.1. Unoccupied houses

Marylands homestead is likely to remain occupied as SunWater does not propose to purchase the entire property. Collaroy homestead, if left on site, would be on an island at FSL and only accessible by boat. This, along with the lack of road access to the area in general, was the basis of the conclusion that risk of vandalism was low if it were to be left on site. The Ridgelands house was assessed as of no heritage significance.

Section 24.3.4 of the EIS proposed a strategy to relocate unoccupied houses to Nebo for workers accommodation. This remains SunWater's preferred alternative as the structures will then survive and be maintained. The study and associated report noted in the following section will ensure the significance of Collaroy is recorded.

23.2. Archaeological surface study at Collaroy

SunWater commits to undertake the study noted as a mitigation strategy in Section 23.2.4 of the EIS. The requirement to notify DERM of any significant findings was noted in Section 29.9.18 of the EMP.

23.3. Reporting of discoveries

The EMP has been amended to note that the Project archaeologist will be on-call to determine the significance of discovered items and if formal reporting to DERM is required.

24. SOCIAL VALUES AND MANAGEMENT OF IMPACTS

The following key issues were raised by submitters in relation to the EIS:

- The supply of water to urban areas;
- Provision of recreational facilities; and
- Potential impact to local health services.

24.1. Training and employment opportunities

SunWater acknowledges the offer by DEEDI to assist with training and employment opportunities offered by the Project. Following project approval, detailed design and appointment of a contractor, SunWater and the Contractor will approach DEEDI for assistance.

Pro-active employment strategies will be included for people with disabilities, women and people who speak a language other than English.

24.2. Urban water supply

Urban demands for water were recognised in Section 1.3.2.2 and 1.3.3 of the EIS. Urban demand represents approximately 5% of the probable high priority yield of the storage. That volume may be contracted directly by the Isaac Regional Council or via another client (or group of clients) on their behalf.

Section 24.2.2.3 of the EIS noted that water restrictions were in place in Nebo at the time of writing the EIS. Urban water supply is the responsibility of local government and SunWater is aware that Isaac Regional Council is assessing supply options available to it. Water from Connors River Dam is one of those options. As urban demands are strongly related to mining industry activity the EIS suggested that one option may be for mines to acquire some water from the dam for urban purposes. SunWater operates on a commercial basis so Council and the mining industry should consider the options available to them.

Since the release of the EIS, SunWater has been involved in negotiations with the Isaac Regional Council, potential foundation customers of the Project and the State Government (DERM) regarding future supplies to townships from the Connors River Dam. Those discussions are on-going, and at the time of writing, a future Connors River Dam supply to the townships of Nebo and Moranbah is probable.

The supply of water to the coastal region within close proximity to the Greenhill and Carmila areas was considered unfeasible given the relatively minimal volumes of water required and the high associated costs for construction and operations of a pipeline passing through the Great Dividing Range.

24.3. Bicentennial Trail

Section 7.2.1.2 noted that the relocation of the trail from the area of impact would be discussed with the National Bicentennial Trail organisation. The mitigation is that the trail will be re-established in a suitable location.

24.4. Recreation area

SunWater is committed to design the recreation facilities in accordance with the Australian Standards Design for Access and Mobility.

SunWater recognises the potential regional importance of the site for recreation purposes and that a commercial enterprise could potentially operate here. SunWater will negotiate conditions of use or tenure for the area that do not conflict with the primary purpose of the water storage but allow reasonable development, including potential commercial development of recreational facilities.

The recreation area is further discussed in Section 2.1 of the Supplementary Report.

24.5. Health services

As indicated Section 24.3.5 of the EIS, there are currently no health care facilities located in Nebo, with the nearest medical centre located in Sarina, and other health and medical services (i.e. hospitals and general practitioners) located at Moranbah and Mackay.

As discussed in Section 21.3.3 of the EIS, while the potential impacts on health and emergency services is expected to be minimal with no significant increases on services required, ongoing consultation with Queensland Police Service (QPS), Queensland Fire and Rescue Service (QFRS) and Queensland Health will be undertaken to ensure that services are able to accommodate the Project and any associated impacts are addressed.

During construction, the Project will generate direct employment opportunities for about 570 workers over the 20 month construction period, peaking at about 620 workers. The majority of construction workers would reside within a construction camp. Medical services to be provided at the camp would include first aid officers and a nurse/ doctor to respond to primary health and medical needs. This will help to reduce demand for health services by construction workers and potential impacts on existing health services. A health and safety plan would will be developed and implemented, including communication with all site based workers. This will assist in reducing the number of project-related emergencies.

Emergency response plans will also be developed in consultation with local emergency services, to ensure the effective response to construction-related incidents. It is expected that this would involve consultation with regional hospitals to determine the capacity of these facilities to respond to potential incidences.

24.6. Fatigue management

A Fatigue Management Plan in relation to road safety management was noted in Section 24.3.7 of the EIS and will form part of the Traffic Management Plan discussed in Section 29.9.17 of the EIS. A road safety education and awareness program for workers was included in Section 29.3.19 (EIS) and will include fatigue management.

25. ECONOMIES AND MANAGEMENT OF IMPACTS

No issues were raised with respect to this section.

26. HAZARD AND RISK

26.1. Emergency management

SunWater acknowledges the requirement to include all emergency services in the development of emergency plans. This specifically includes Queensland Police Service (QPS), Queensland Fire and Rescue Service (QFRS), State Emergency Services and Queensland Ambulance Service (QAS) and hospital services. Emergency planning will be undertaken during detailed design, when a construction contractor has been appointed. This is because aspects of the Project that are particularly relevant to such planning are strongly influenced by the contractors work practices, policies and procedures.

Evacuation and access maps of the construction camps, including the identification of a possible helicopter landing site if required, will be provided to emergency services during the emergency planning process.

SunWater acknowledge that due to the project's relative isolation from immediate emergency service response, it is essential that staff working and/or living at the construction site are fully conversant with the Emergency Management, Action Plan and Response procedures including the use of installed fire fighting equipment along with any other on site equipment that is primarily for their use.

The construction camps will be designed and built in accordance with State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide. It is noted that QFRS has a legislative jurisdiction to provide input into the design of a building or a structure's fire safety systems as an advice agency.

27. CUMULATIVE IMPACTS

27.1. Aquatic weeds and pest animals

While the cumulative impact chapter did not recognise aquatic weed or animal introduction as a significant cumulative risk, the risks per se were recognised in the appropriate chapters (12 and 13 of the EIS) along with mitigation strategies. SunWater will also include a commitment to provide on-site signage at the dam regarding methods to avoid transfer of pest aquatic plants and animals.

27.2. Downstream wetland connectivity

Impacts on medium to high flows at the Fitzroy Barrage with and without the dam were shown in Table 14-30. All mandatory and non-mandatory objectives are met, generally with a substantial margin, other than the non mandatory upper riparian zone statistic, though the mandatory target was achieved with a 2% buffer. Results of IQQM modelling of the cumulative impact scenario (with all proposed dams and weirs in the catchment included) were shown in Tables 14-45 to 14-47. Of the 17 statistics examined, only 4 failed to meet the stipulated criteria and the degree of divergence was sufficiently small that the chapter concluded that development of operational strategies for the included potential future storages would resolve the discrepancies. Interestingly, some medium to high flow statistics at the Barrage, including the floodplain zone statistic, actually improved because the preliminary operational strategy for the Eden Bann and Rookwood developments kept the barrage storage at the current nominal operating level, whereas traditionally it is drawn down.

27.3. Waterway barriers

The barrier effect of Connors River Dam is discussed in Section 13.1 of the Supplementary Report.

SunWater is the proponent for two other weir or dam projects in the Fitzroy catchment. The Lower Fitzroy Weirs project includes a proposal to raise the existing Eden Bann Weir and to construct a new weir at Rookwood. The latter site is upstream of Eden Bann and below the junction of the Dawson and Mackenzie Rivers. The Nathan Dam project will flood the existing Glebe Weir, thereby replacing an existing barrier with a much larger one. However Glebe Weir does not have a fauna transfer device whereas Nathan Dam will. Eden Bann currently has a fish transfer device and this will be replaced and upgraded on the raised structure should it be approved. Rookwood constitutes the only entirely new barrier and it will include a fish transfer device.

27.4. Offsets

One submission questioned whether environmental offsets actually achieved their intended purpose because implementation of the Project must lead to a net loss of available habitat. It is true that the inundation area for example will be lost as terrestrial and riverine habitat however the aim of State and Commonwealth offset policies is to ensure there will be a net increase in the amount of quality habitat which is securely protected. Hence the offset commitment includes long term management of currently degraded (non-remnant) habitat such that it returns to remnant status in addition to management of areas of remnant habitat such that they can offer greater habitat value than they do at present. The tenure requirements of offset policies also ensure that this high value habitat is then safe from future development. The net result, despite loss of habitat within the inundation or works areas, is a worthwhile improvement relative to the current situation.

27.5. Consequential impacts - use of medium priority yield by irrigators

The EIS presented an overview of the impacts of the Project and the potential for cumulative impacts arising from the Project construction and operation. The only potentially significant cumulative impacts identified are changes to flow regime (local), use of medium priority yield by irrigators and vegetation clearing. These impacts are controlled by the management and mitigation measures described in the EIS (Table 27-1) and are balanced against the significant positive social and economic benefits of the Project.

Impacts associated with medium priority users were discussed in detail within Section 27.3.2.2 of the EIS. The information originally presented in the EIS is reproduced verbatim below.

Water products to be supplied by the dam include 5,000 ML/a of a lower priority water suited to purchase by irrigators. The lower priority water (hereafter referred to as medium priority) is intended for irrigated agriculture as far downstream as the Mackenzie River and is modelled as being extracted at Big Bend. The actual location of use should this scenario be adopted will be dependent on purchase of the new allocation and conditions of supply set by the regulator, that is, all the water may not be used at Big Bend or even at one point but may be spread between the dam and Tartrus Weir (near Big Bend), the likely downstream limit of any supplemented supply from Connors River Dam. SunWater assumes that the most likely purchases of the water will be current irrigators who wish to increase either their security or their cropped area or unsupplemented users who wish to, primarily, increase their security. It is common practice for unsupplemented users to purchase a relatively small supplemented entitlement simply to improve security of supply in drier years. In such cases the increased water availability is unlikely to result in an increase in the area cropped but it will improve productivity and crop production consistency.

Under the *Water Act 2000*, Land and Water Management Plans (LWMPs) must be developed for any new water entitlement for irrigated agriculture. The purpose of LWMPs is two-fold:

1) To provide certainty that water allocated by government will be used in a manner that does not cause degradation of land or water resources

2) To provide individual landholders with an effective farm management plan which demonstrates that irrigation farming practices are sustainable, both on and off farm.

The Plans describe infrastructure, natural resources and management practices in the use of land and water resources. They are prepared by individual landholders to plan the productive, profitable and sustainable use of water for irrigation purposes.

Agriculture is also not a relevant purpose for clearing of vegetation under the VM Act so remnant vegetation cannot be cleared for any new irrigation areas.

28. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

No issues were raised with respect to this section however given earlier correspondence with DEWHA (now SEWPAC) the results of further survey for Fitzroy River Turtle, and further development of the Project environmental offset strategy, this section will address those issues.

For clarity, it has been noted that at one point in the MNES chapter the width of clearing for the pipeline in riparian zones is noted as 10 m. This is incorrect as clearing will be restricted to 10 m either side of the centreline (for a total width of 20 m) in such areas.

28.1. Listed threatened species and communities

28.1.1. Flora

The EIS reported that no flora communities or species listed under the EPBC Act were observed within the dam construction area or inundation area and only *Eucalyptus raveretiana* was thought possibly present, though intensive survey failed to find it.

Up to 1.56 ha of endangered Brigalow was mapped on the preferred pipeline alignment within the EIS. Supplementary alignment options presented in Section 2 (part C) may increase the area of impact by <0.01 ha. 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 was no Brigalow in the dam and surrounds area so inclusion of Brigalow impacts within the strategic offset approach is not possible.

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.

No EPBC listed threatened flora species were observed on the pipeline alignment but the EIS suggested that *Eucalyptus raveretiana* could possibly occur as 4.4 ha of potential habitat existed. Pipeline refinement increases this area to 6.7 ha. The grass species *Digitaria porrecta* (endangered), *Dicanthium queenslandicum* (vulnerable) and *D setosum* (vulnerable) were also thought to potentially occur within a single 4.1 ha patch of RE 11.4.13 which occurs between Funnel and Denison Creeks. If the summer survey confirms presence of the species it is highly likely that much of the impact can be avoided by a minor shift in the pipeline alignment. If not, offsets will be established as above.

28.1.2. Fauna

Southern Squatter pigeon (vulnerable) 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 by the Project 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 offset included as part of the State Vegetation 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.

The Fitzroy River Turtle survey report is included as Appendix D-6. The report confirms that the species is present within and downstream of the Project footprint and is likely to extend upstream of the proposed inundation area. It is concluded that the project area represents the upstream limit of distribution of the species. Section 13.1 discusses the information presented in the EIS and the relevance of the latest survey results. SunWater commits to each mitigation strategy, and an associated monitoring program, as noted in Section 13.1.

As a result of a residual minor impact on the species, SunWater offers an environmental offset. The direct offset for this Project is suggested as protection and management of sections of river and riparian zone downstream from the dam which are known (or may be confirmed in the future) to support the species. This 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 (such as survey Site 4), particularly nesting areas, and that these be the target of management actions. The environmental offset strategy for the project includes the need to find and secure suitable Order 5 stream watercourse vegetation and SunWater aims to achieve this in the area immediately downstream from the dam as far as possible. This will be of direct benefit to the Fitzroy River turtle and the aim is to co-locate these offsets.

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 not specific to Fitzroy River Turtles but it will be undertaken in the Fitzroy catchment. It is envisaged that an existing weir which currently has no facility for passage will be fitted with alternative designs and the designs 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 this long stretch of river. Similarly the recent photographic evidence of a specimen from Glebe Weir on the Dawson River (pers.comm C. Limpus DERM) 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 the "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 if protection by volunteers is not undertaken.

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".

28.1.3. Summary of impacts to MNES

Table 28-1 summarises impacts to MNES, potential further mitigation measures and the requirement for offsets. The figures take into account the refinements to the pipeline alignment described in Part C Section 2.

Table 28-1 Impacts to MNES

Controlling provision	Direct impact?	Indirect impact?	Mitigation	Offset?
World Heritage, National Heritage Place, Wetlands of international importance	No	Flow regime, water quality, sediment regime: not significant	Not required beyond Project EMP and commitments	Not required
Listed threatened species and communities				
Brigalow (*Acacia harpophylla* dominant and codominant)	Up to 1.57 ha on pipeline only plus up to 0.67 ha of regrowth	Possible edge effects / fragmentation	Potential to realign pipeline and reduce impact. Natural regrowth allowed in 15 m of easement	Offered in immediate area if required after mitigation
The Bluegrass (*Dicanthium* spp) dominant grasslands of the Brigalow Belt	Possible (up to 4.1 ha) on pipeline only	Possible weed invasion	Summer survey to confirm presence. Potential to realign pipeline and avoid or reduce impact	Offered in immediate area if required after mitigation
Eucalyptus raveretiana (V)	Possible. Not found in easement but up to 6.7 ha of suitable habitat.	Possible edge effects, weed invasion	Pre-construction survey to confirm presence. Potential to realign pipeline and avoid or reduce impact if the species is present. Propagation from local seed and use in rehabilitation	Offered in immediate area if required after mitigation
Digitaria porrecta (E), *Dicanthium queenslandicum* (V) and *D setosum* (V)	Possible (up to 4.1 ha) on pipeline only	Possible weed invasion	Summer survey to confirm presence. Potential to realign pipeline and avoid or reduce impact	Offered in immediate area if required after mitigation
Southern Squatter pigeon (V)	Clearing of up to 1830 ha of suitable habitat at dam and 165.82 ha on the pipeline		Impact largely unavoidable	Conforming State level offsets plus an area of contiguous remnant vegetation (to be quantified) near dam
Fitzroy River turtle (V)	Yes. Occupies large proportion of dam area but probably in low densities	Yes. Flow regime change, barrier effect and possible occasional water quality issues. Cumulative impact across proposed water resource projects	Range of strategies within design of physical infrastructure, habitat creation in dam, environmental flow strategy	Offered as: Direct nesting habitat and nest protection downstream and linked to State offset requirement for watercourse vegetation Implementation of results of $4M dividend reinvestment scheme research into barrier

Controlling provision	Direct impact?	Indirect impact?	Mitigation	Offset?
				effect For cumulative impact, $100k for 5 years toward ecological research and monitoring in catchment.
Migratory species				
Rainbow Bee-eater; Rufous Fantail; White-bellied Sea-Eagle; Cotton Pygmy-goose; and Great Egret.	Yes, related to habitat but assessed as negligible and possibly positive for wetland related species	No	Not clearing to within 1.5 m vertical of FSL will provide stag habitat for roosting.	Vegetation offsets at State level will provide suitable feeding habitat.

Several other threatened or migratory fauna species have potential to occur in the Project area but have not been confirmed as directly impacted. Should they be confirmed prior to construction the mitigation and offset strategies will be updated accordingly.

29. ENVIRONMENTAL MANAGEMENT PLANS

The following key issues were raised by submitters in relation to the EIS:

- Construction environmental management plans; and
- Operational environmental management plans.

29.1. Construction environmental management plans

29.1.1. Pest flora and fauna

29.1.1.1. Competence, awareness and training

As discussed in Section 29.6 of the EIS, environmental awareness training must be carried out to ensure that all personnel performing activities related to environmental management practices are training, qualified and competent.

As discussed in Section 2.4.5 of the EIS, at the commencement of site establishment a Site Environmental and Safety Plan including a site induction program setting out requirements and procedures will be developed. This will include requirements and procedures in relation to environmental protection including terrestrial and aquatic weed and fauna management. All employees/ contractors have an obligation to participate in the identification and management of pest species whilst working on the Project.

29.1.1.2. Construction water

Section 2.5.3.3 of the EIS describes the methodology for sourcing water and its appropriate use during the construction phase which is aimed at using local sources wherever possible. For dam works, the intention is that construction water is to be drawn from the Connors River under Permit. It is not expected that external water will be required but should that circumstance eventuate, the likely first option would be the nearest water source established for the pipeline, which is likely to be a bore and therefore have little risk relating to aquatic weeds. No pest species were recorded in the Connors River or in nearby creeks.

29.1.2. Indigenous and non-indigenous cultural heritage

In addition to the mitigation measures proposed in Section 29.9.18 of the EIS, a Project Archaeologist will be on call to provide advice about the potential significance of any discoveries in relation to the historical context of the area. In the event that any indigenous or non-indigenous cultural heritage items are uncovered during the course of construction of the Project, work in the immediate area should cease and the Project Archaeologist will be notified of the discovery and advise of the potential significance in relation to the historical context of the area prior to reporting to DERM. If considered significant by the Project Archaeologist, any findings of indigenous and non-indigenous cultural heritage will be reported to DERM and SunWater.

29.2. Operational environmental management plans

29.2.1. Management of water storage and pipeline

29.2.1.1. Flow management

One submission suggested monitoring should be undertaken of the impacts on downstream instream and riparian habitat (as a minimum up to 44 km downstream of the dam, confluence with Funnel Creek) and the efficacy of flow management on reducing those impacts. Section 14.5.1.3 of the EIS, and the associated risk tables, suggested changes to hydraulic habitat were only likely quite close to the dam hence monitoring was suggested for only 2 sites below the dam. SunWater will commit to include a further site downstream of Funnel Creek, meaning 2 sites will be between the dam and Funnel Creek, and one downstream of Funnel Creek. This commitment is additional to monitoring commitments related to watercourse vegetation offsets under the VM Act and to the Fitzroy River turtle.

29.2.1.2. Fishway reporting

It is stated in Section 29.5.3 of the EIS that the operation of the fish lift/ lock (fishway) will be reported annually as part of the environmental reporting in accordance with SunWater's EMS and legislative requirements. SunWater will consult with Fisheries Queensland to determine the reporting framework for the operation of the fishway. Relevant outcomes of the consultation with Fisheries Queensland will be incorporated into the environmental reporting schedule.

30. CONCLUSIONS AND RECOMMENDATIONS

No issues were raised with respect to this section.

The conclusions and recommendations presented in the EIS remain valid.

PART C REFINEMENT TO PROJECT DESCRIPTION

1. NEW ACCESS ROAD TO MARYLANDS

1.1. Project description

As a result of the confirmation of the Project land purchase requirements, a new access to Marylands property has been investigated (Figure 1-1). The road will also allow continued access to Deacey and Mountain View. In the appended report the preferred route is referred to as the northern option and it commences at the Connors River Collaroy Rd just south of the dam site and initially follows a Powerlink easement to traverse a ridge then leaves the easement after about 4 km and travels through mainly cleared grazing country before crossing Collaroy Creek and joining the existing Killarney-Collaroy Road from which the house is accessed. The route is approximately 14.2 km long.

The preliminary design accords with the "Rural Road Design; A guide to the geometric design of rural roads" (Austroads series) and is designed to cater for Class 11 double road trains. Final designs will be in accordance with the requirements of Isaac Regional Council. It is a 1-lane unsealed rural access road of 3.5 m width and 1 m shoulders. The design speed is 60 km/hr. While the majority of the route is relatively flat, the 1 km section through the saddle to reach the Connors River Collaroy Road is relatively steep and will require cuts up to 10 m deep to achieve standard. This is assumed to be rippable. This section through the cutting is proposed to be sealed. Sediment and erosion control procedures will be specifically developed for this road.

A bridge is required over Collaroy Creek and is proposed as concrete bridge deck units 4.5 m wide and with a total span of 160 m. Five causeways, three major culvert crossings and 13 minor culvert crossings are also required. The requirement for approvals for works in watercourses is recognised.

The estimated cost of the road is $9M at an 80% probability level of accuracy.

It would be constructed coincident with dam construction so utilise dam or road construction plant, workforce, construction site facilities and construction camp. Facilities at dam related quarries could be used to prepare pavement materials. Daily work schedules, worker transport etc would apply as per the dam construction processes.

There are no sensitive receivers in close proximity to the route and it primarily traverses Marylands and that part of Doreen which is proposed to be purchased for dam and road construction. Other than the Powerlink powerline, there are no utility services or public facilities on or near the route. As such no additional impact studies related to air, noise, traffic, land use etc are required and because the road is now an integral part of the project, all EMP elements, mitigation strategies and proponent commitments included within the EIS will similarly apply to the road. However additional terrestrial flora and thereby habitat for fauna, is impacted so has been assessed and reported below. The full flora field assessment is included as Appendix D-7.

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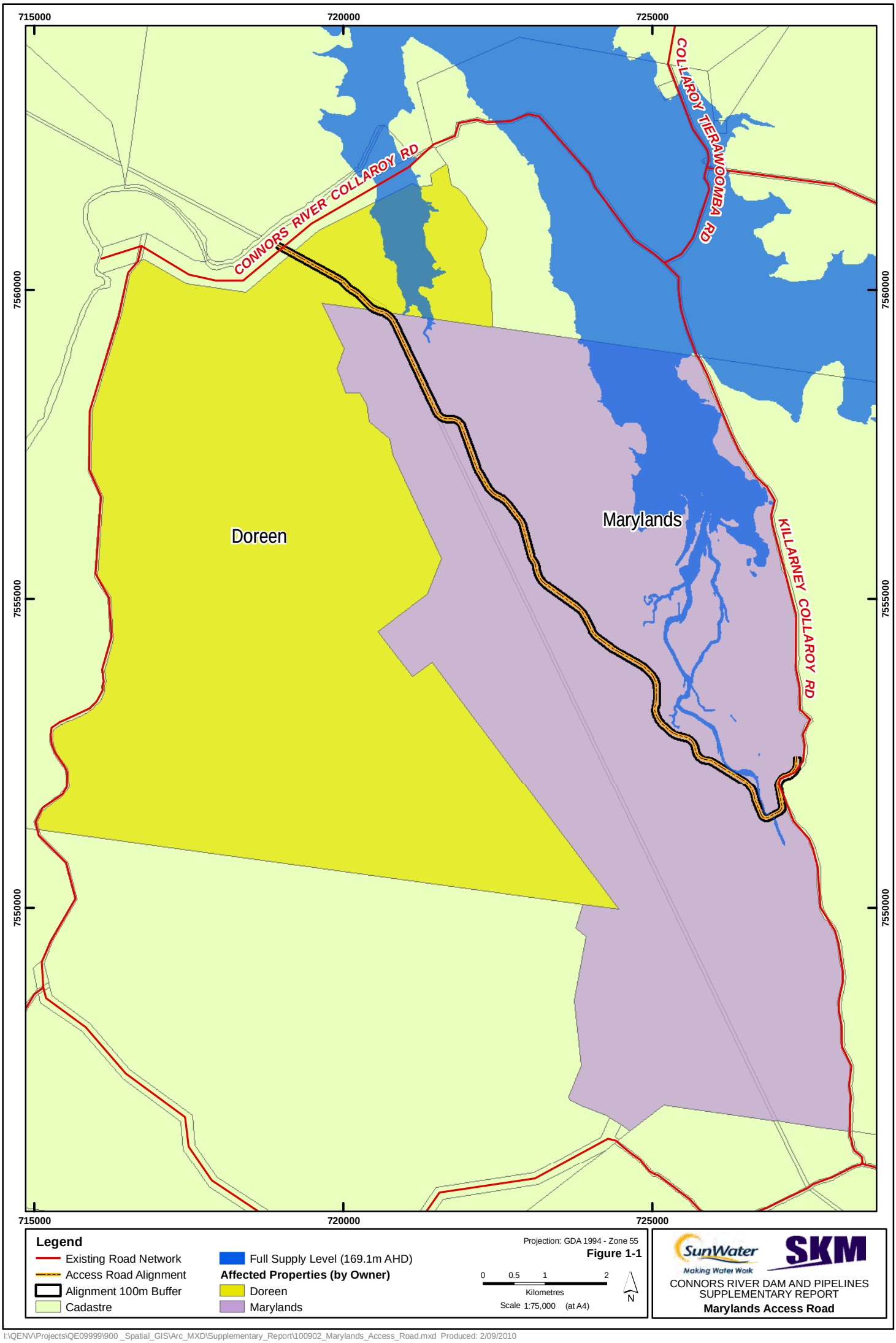

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1.2. Terrestrial flora

The terrestrial flora assessment methodology mirrored that of the EIS with database searches and review of aerial photography followed by field survey. A single survey was undertaken in January 2011. Mapping used a 500 m buffer from the centreline so any possible future realignments could be assessed.

No vegetation communities listed as significant under the EPBC Act (1999) were identified in the study area, inclusive of the 500 m buffer. Reference to DEWHA (2001b) indicates that the Regional Ecosystem 11.12.4, being on granitoid lithology, is not included under the EPBC classification for Brigalow.

The majority of the current alignment consists of non-remnant vegetation (grazing areas) or RE11.12.1, with much smaller areas of several other Regional Ecosystems as noted in Table 1-1. Once the final road alignment is confirmed the impacted vegetation will be incorporated within the Projects Environmental Offset Strategy as discussed in Appendix D-4.

Table 1-1 Regional ecosystems within Marylands Rd alignment based on revised mapping.

Regional Ecosystem	Short Description (DERM 2009b)	Vegetation Management Status	Biodiversity Status
11.3.4/ 11.3.4a	*Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland on alluvial plains.	OC	OC
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	OC	OC
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines. 11.3.25b: Riverine wetland or fringing riverine wetland. *Melaleuca leucadendra* and/or *M. fluviatilis, Nauclea orientalis* open forest.	LC	OC
11.3.9	*Eucalyptus platyphylla*, *Corymbia* spp. woodland on alluvial plains.	LC	NCAP
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains/remnant surfaces.	LC	NCAP
11.12.1	*Eucalyptus crebra* and/or *E. melanophloia* +/- *C. erythrophloia* shrubby woodland. Occurs on igneous rocks. Also includes localised areas dominated by *E. persistens*.	LC	NCAP
11.12.2	*Eucalyptus melanophloia* woodland on igneous rocks	LC	NCAP
11.12.4	Semi-evergreen vine thicket and microphyll vine forest on igneous rocks	LC	NCAP

No threatened species were encountered during field surveys but one species listed under the NC Act was thought likely to occur (*Cerbera dumicola*, which also occurs at the dam wall site) while two listed under the NC Act (*Eucalyptus reveritiana* and *Actephila sessiliflora*) and one listed under the EPBC Act (*Eucalyptus reveritiana*) were thought possible occurrences, though neither of the latter was found during EIS surveys. If these species are confirmed as present during pre-construction surveys then mitigation and offset strategies as discussed in the EIS and SEIS will apply.

1.3. Terrestrial fauna

1.3.1. Methodology

All of the findings presented in this section are based on a desktop literature review and analysis of data derived from database searches, information held by agencies/ individuals, interpretive reports and results of EIS field surveys. The major databases searched include the:

- Commonwealth's EPBC Online Protected Matters Search Tool;
- EPA's Wildnet;
- EPA's RE Description Database (REDD, Version 6.0, 2009); and
- EPA RE digital data (Version 6.0, 2009).

1.3.2. Results

1.3.2.1. Database searches

Listed threatened species

Fourteen listed threatened species were identified in the database search results. Likelihood of occurrence was then evaluated and the results are presented in Table 1-2. Only the Rufous Owl was not considered in the EIS for the dam and surrounds area though it was assessed for the pipeline. EIS surveys recorded Squatter pigeon and Little Pied Bat.

Table 1-2 EVR Fauna potentially present within Marylands Access Road study corridor

Scientific Name	Common Name	NCA Status[1]	EPBC Status[2]	Likelihood of Occurrence	Source[3]
Erythrotriorchis radiatus	Red Goshawk	E	V	**Possible.** Well-vegetated riverine habitat in the vicinity of the study corridor provides suitable habitat.	EPBC
Geophaps scripta scripta	Squatter Pigeon (southern)	-	V	**Likely.** Squatter Pigeons were commonly recorded within the broader study area during EIS surveys.	EPBC
Neochmia ruficauda ruficauda	Star Finch (eastern), Star Finch (southern)	-	E	**Unlikely.** This subspecies of Star Finch has disappeared from most of its range. In Queensland it is now only found at scattered sites and is probably locally extinct within the study area.	EPBC
Rostratula australis	Australian Painted Snipe	-	V	**Likely.** The presence of suitable water bodies indicates that this species is likely to occur during favourable conditions.	EPBC
Dasyurus hallucatus	Northern Quoll	-	E	**Unlikely.** This species is mostly found in rocky eucalypt woodland within 200 km of the coast. There are no records for this species in the study area.	EPBC
Nyctophilus timoriensis (South-eastern form)	Greater Long-eared Bat	-	V	**Unlikely.** *Nyctophilus timoriensis* is currently undergoing taxonomic revision and will be re-described as four separate species. The South-eastern Long-eared Bat is the 'form' which may occur in the study area. It occurs in a variety of habitats but is most common in box/ironbark/cypress pine woodland on sandy soils on the western slopes and plains. There are no database records and it is considered unlikely to occur in the local area.	EPBC
Pteropus conspicillatus	Spectacled Flying-fox	-	V	**Unlikely**. The Spectacled Flying-fox is specialised to rainforest (Richards et al. 2008 and it is not known from south of Hinchinbrook Island (Ingram and Raven 1991; Churchill 1998), so it is considered highly unlikely to occur near the study site.	EPBC
Rhinolophus philippinensis (large form)	Greater Large-eared Horseshoe Bat	-	E	**Unlikely.** The most southern record of the species occurred at Paluma (c. 80 km north of Townsville) so it is unlikely to occur in the study area.	EPBC
Denisonia maculata	Ornamental Snake	-	V	**Unlikely.** The species is found in woodlands and shrublands, such as Brigalow, and in riverine habitats, and lives in soil cracks and under fallen timber. There is no Brigalow within the proposed inundation area and the species is not considered likely to occur.	EPBC

Scientific Name	Common Name	NCA Status[1]	EPBC Status[2]	Likelihood of Occurrence	Source[3]
Egernia rugosa	Yakka Skink	-	V	**Unlikely.** The soil type and existing habitat within the study area indicate that the occurrence of Yakka Skinks is unlikely.	EPBC
Furina dunmalli	Dunmall's Snake	-	V	**Unlikely.** Occurs in vegetation communities including Brigalow, Belah and Cypress Pine. None of these communities are present within the study corridor which is also outside of known distribution for this species.	EPBC
Rheodytes leukops	Fitzroy River Turtle	-	V	**Possible.** The Fitzroy River Turtle was found in creeks of the study area during EIS surveys though it was not found in Collaroy Creek.	EPBC
Ephippiorhynchus asiaticus	Black-necked Stork	NT	-	**Likely.** Black-necked Stork is most frequently recorded in open fresh waters such as shallow swamps, billabongs and pools on floodplains. It is likely that the Black-necked Stork occurs only sporadically within the study area.	WL
Ninox rufa queenslandica	Rufous Owl (southern subspecies)	V	-	**Unlikely**. Occurs in closed forest and other dense vegetation. No suitable habitat is present within study corridor.	WL

1 NC Act Status: Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (LC)
2 EPBC Act Status: Endangered (E), Vulnerable (V)
3 Source: Wildlife Online (WL), Queensland Herbarium (QH), EPBC Act Protected Matters Search Tool (EPBC)

Migratory Fauna

Twelve migratory species listed under the EPBC Act were identified in the database search results. Likelihood of occurrence was then evaluated and the results are presented in Table 1-3. All species were assessed in the EIS for the dam and surrounds and it was concluded they were generally common and none would be considered to represent a significant population.

Table 1-3 Migratory species potentially occurring in the Marylands Access Road study corridor

Scientific Name	Common Name	NCA Status[1]	EPBC Status[2]	Likelihood of Occurrence	Source[3]
Terrestrial Migratory Species					
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	**Possible.** One individual was recorded flying over the Connors River during the June survey. The study area currently provides little suitable habitat for this species.	EPBC
Hirundapus caudacutus	White-throated Needletail	-	M	**Possible.** White-throated Needletail is an aerial species that may at times fly over the study area	EPBC
Hirundo rustica	Barn Swallow	-	M	**Unlikely.** Barn Swallow occurs on a regular basis in Australia only in the north. In Queensland it is a vagrant south of Townsville.	EPBC
Merops ornatus	Rainbow Bee-eater	-	M	**Likely.** The species was regularly recorded during both the March and June surveys.	EPBC
Monarcha melanopsis Black-faced Monarch		-	M	**Likely.** Black-faced and Spectacled Monarchs and Satin Flycatcher all occur in more moist habitats such as wet sclerophyll forest and riparian vegetation. The monarchs also frequent closed forests, including vine-thickets. Suitable habitat nearby to study corridor.	
Monarcha trivirgatus Spectacled Monarch		-	M		
Myiagra cyanoleuca Satin Flycatcher		-	M		
Migratory Wetland Species					
Ardea alba	Great Egret	-	M	**Likely.** Great Egrets forage in a wide range of habitats including artificial waterbodies and other modified habitats such as pasture. It is common and widespread throughout its range.	EPBC
Ardea ibis	Cattle Egret	-	M	**Possible** Cattle Egrets inhabit grasslands, wetlands and wooded lands, often foraging away from water in grassland, pasture and crops. The species is strongly associated with grazing livestock.	EPBC
Gallinago hardwickii	Japanese Snipe (Lanthams snipe)	-	M	**Likely.** Latham's Snipe occurs in swamp and marsh margins and in wet pasture. The species is likely to occur seasonally within the study area.	EPBC
Nettapus coromandelianus albipennis	Australian Cotton Pygmy-goose	-	M	**Likely.** The Cotton Pygmy-goose occurs in terrestrial wetlands. Four birds were recorded on a billabong 7.5 km south-west of the dam site.	EPBC
Rostratula benghalensis s. lat.	Painted Snipe	-	M	**Likely.** The presence of suitable water bodies indicates that this species is likely to occur during favourable conditions.	EPBC

1 NC Act Status: Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (LC)

2 EPBC Act Status: Endangered (E), Vulnerable (V)

3 Source: Wildlife Online (WL), Queensland Herbarium (QH), EPBC Act Protected Matters Search Tool (EPBC)

1.3.2.2. Habitat values within the study corridor

Habitat types and the fauna which may be present within them have been fully described in the EIS. Three of those habitat types occur within the road study area:

1) Woodland and Open Forest on Alluvial Soils; the proposed alignment intersects small portions of this habitat type along its entire length with most occurrences in the south.

2) Woodland and Open Forest on Non-alluvial Soils; the northern portion of the proposed alignment intersects this habitat type with the remainder occurring west of the alignment.

3) Rivers and creeks, both permanent and ephemeral and including billabongs; the southern portion of the proposed access route crosses Collaroy Creek and a number of smaller drainage lines are also crossed. Collaroy Creek meets these criteria under the Biodiversity Planning Assessment (BPA) as riparian habitat having a Very High corridor value.

1.3.3. Summary; terrestrial ecology

The findings of this assessment closely mirror those of the EIS and this was expected due to the close proximity of the road to the previously assessed dam and surrounds area. As a result, the mitigation strategies and EMP elements developed for terrestrial flora and fauna within the EIS will be equally applied to the road and residual impacts are considered minor or negligible.

2. PIPELINE REFINEMENT

2.1. Project description

Route selection for the pipeline has continued and has resulted in the exclusion of some options presented in the EIS but the inclusion of some realignments which largely resulted from interactions with other infrastructure owners. The preferred pipeline alignment and remaining options is shown in Figure 2-1.

In summary, the alignment refinements are:

- Eastern Option B (EOB), BMA Option A (BA), BMA Option B (BB) and Moranbah Option (MO) are no longer included
- Pump station 1 has been split into two separate stations consisting of a low lift – high lift combination. PS1 remains near the dam while PS2 will be at the 5 km point prior to crossing Connors River. A 5ML balancing storage is also proposed and will replace that originally proposed in Area 2. This will reduce impact on Lot 2 on KL140 but increase impacts on Lot 1 on KL163, which was already impacted. Both lots are owned by the same landowner. The footprint of the infrastructure is approximately 1 ha.
- The preferred pipeline alignment has been altered between the 47and 56.5 km points (measured from the dam) near Denison Creek crossing (DCC). The realignment was instigated following consultation with BMA to avoid impacts on existing bore and pipeline infrastructure and future changes to that infrastructure. The alignment has been moved south to avoid impacts on private irrigation infrastructure and has resulted in a shortened route and reduced landholder impacts.
- The preferred pipeline alignment has been altered between the 80.7 and 95.5 km points (measured from the dam) near Coppabella. This realignment was required following provision of information from QT that the railway and highway may eventually need to move south, hence the pipeline would also need to move. The new alignment now avoids impact on 11 small lots but impacts on one more large lot and crosses two additional easements.
- The preferred pipeline alignment has been altered between 127.2 and 131.7 km near Moranbah. The realignment is as a result of the potential electrical interference from the existing high voltage powerlines in which the pipeline was to share the easement. The pipeline will now run along the southern property boundary within the same land parcels however it does cross three additional easements.
- Pump station 2 at 54 km in Area 4 has been shifted to 95 km in Area 6 and is within the relocated pipeline alignment section discussed above for Coppabella. It is on a lot owned by QT which was not previously impacted though if this cannot be agreed with QT, it can be relocated immediately south on to a lot which is already impacted. The location is more easily accessed by maintenance crews than the previous location.
- The 600 ML balancing storage noted in the EIS as at 109 km has been shifted slightly to avoid the longwall mining operation. This necessitates a minor shift of the pipeline over a distance of approximately 1.3 km but it remains on the same lot.

- The above changes improve the pumping efficiency of the pipeline and reduce greenhouse gas generation to a small extent. SunWater is continuing to investigate ways to improve pumping efficiency as the EIS showed that this was the largest consumer of energy in the operational phase. An option to use just a single large pump station near the dam is currently under consideration.

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Inset A

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Inset B 1:150,000

LEGEND

- Supplementary Alignment
- EIS Alignment

Projection: GDA 1994 - Zone 55

Figure 2 - 1

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SunWater Making Water Work

SKM

CONNORS RIVER DAM AND PIPELINES

Revised Preferred Pipeline Route

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2.2. Consultation regarding alignment changes

2.2.1. Consultation with landholders

The pipeline alignment described in Section 2.1 will significantly reduce the number of landholders directly impacted by the Project. This is particularly so in the vicinity of Coppabella where eleven 'small lot' landholders on the Peak Downs Highway will no longer be impacted.

No new public landholders are impacted by the alignment changes. New impacts do occur to easements held by Isaac Regional Council, Ergon Energy, BHP Mitsui Coal and Macarthur Coal. All of these entities have been consulted about potential impacts to their easements and formal notification has been drafted and issued.

In some cases realignment has occurred on lots which were already impacted (by the previous alignment) and the landholders were made aware of the original impact.

As the pipeline design has matured and minor alignment changes made, SunWater has recognised the need to consult with impacted landholders. SunWater retains a land access agency (Peter Jinks & Associates) who are qualified rural property valuers and agricultural consultants. Peter Jinks & Associates have undertaken much of the early on-site consultation on behalf of SunWater. More recently, SunWater's Construction Manager has undertaken on-site consultation with those landholders who required further information about the alignment changes and the impacts from forthcoming geotechnical investigations.

Communications with impacted mine operators, lease holders and easement holders have generally been undertaken by SunWater's Brisbane-based Project Development, Design and Legal teams (with SunWater's external advisors present).

No impacted landholders have refused requests to investigate the pipeline alignment changes outlined. Many landholders shared that they have on-going concerns, would like input into the final design of the alignment and have site specific requirements regarding access. The concerns raised were essentially the same as those raised by other impacted landholders during the EIS process, namely possible introduction of weeds, leaving gates open which may lead to a need to muster stock and traffic impacts during construction and operation. The draft EMP in the EIS addresses these issues as does the training initiatives mentioned below. When these issues are addressed it is not expected that the viability of properties will be affected. The majority of landholders have asked for on-going, on-site consultation with SunWater representatives. SunWater has committed to such consultation. All impacted landholders are placed on the project consultation database and will be included in the ongoing Project consultation plan.

Table 2-1 to Table 2-3 indicate the landholdings and easements that are impacted by pipeline re-alignment since EIS release. Figure 2-2 shows the detail of changes at Coppabella where impacts to a number of small lots cannot be clearly seen on larger scale figures. The tables also summarise the extent of impact and note the consultation effort that SunWater has and is undertaking with affected landholders.

It should be further noted that SunWater has voluntarily contracted Sharp Training (a training services provider based in Mackay and Moranbah) to deliver awareness training to all SunWater staff and agents who attend these

sites for investigations. This training, which has now been delivered to the majority of relevant SunWater staff and agents, addresses the major issues that landholders have traditionally raised as a concern for proponents entering land for investigation purposes (e.g. weed transmission, gate closing, use of existing tracks, stock management, and driver behaviour etc).

Table 2-1 Denison Creek Crossing Alignment Change (47 to 56.5km) - land impacts and consultation status

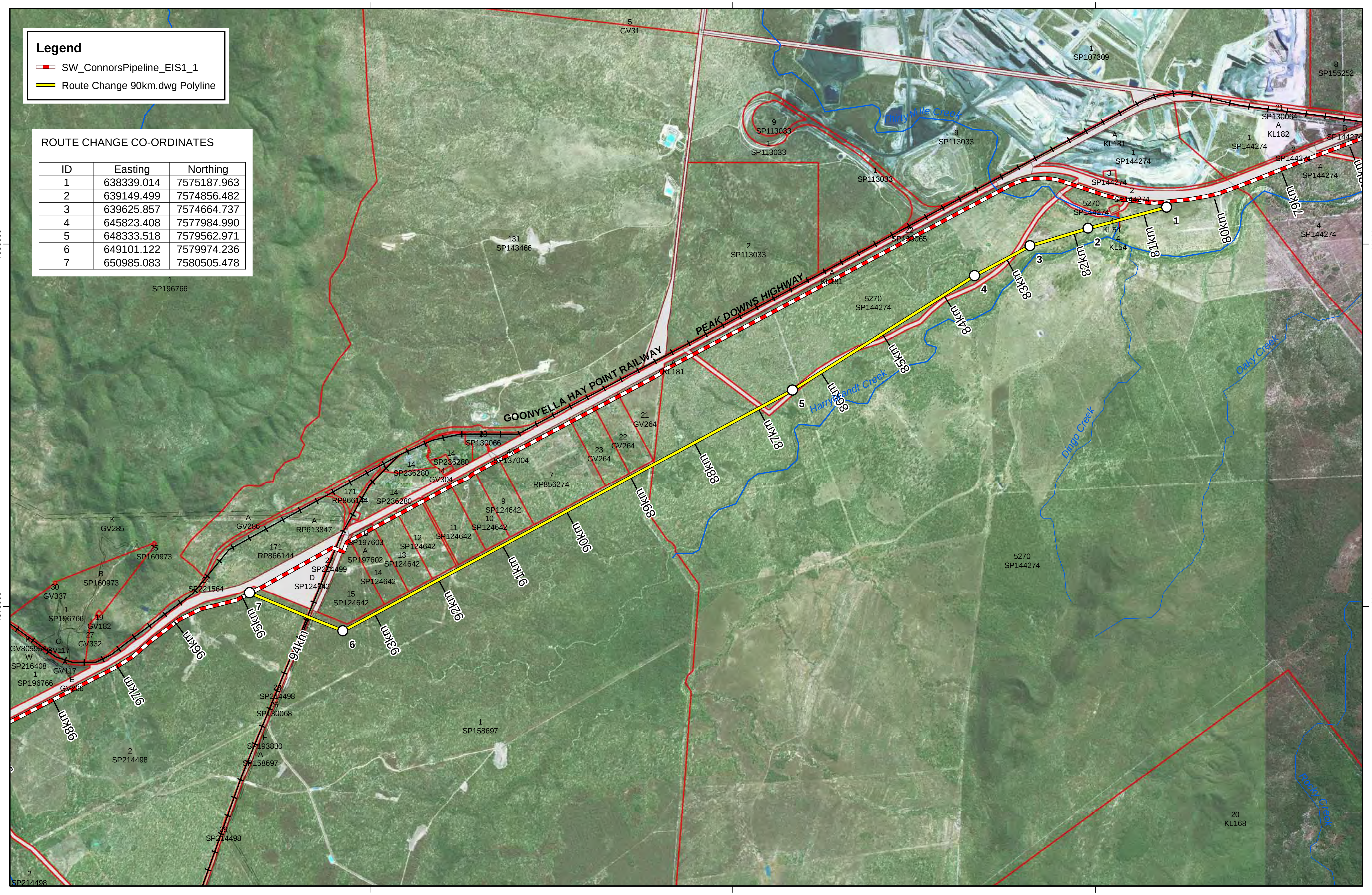
Impacted Property or Easement	Description of impact	Consultation status
Lot 36 on KL811178 'Mt Flora & Oxford Downs'	Alignment change only (similar area of impact)	Established and on-going.
Lot 4 on WHS354 'Hamilton Park'	Alignment change only (similar area of impact)	Established and on-going.

Table 2-2 Coppabella Alignment Change (80.7 to 95.5km) - land impacts and consultation status

Impacted Property or Easement	Description of impact	Consultation status
Lot 5270 SP144247 'Oben Park'	Alignment change only (similar area of impact)	Established and on going
Lot 4 on CPKL54 Unnamed road	Newly impacted (0.06 ha). Low impact; pipeline to cross unused road easement	Established and ongoing
Lot 1 on SP158697 Moorvale mine	Newly impacted (16.04 ha). Low impact as route keeps to boundary behind small lots so minimal interference with operations.	Established and on going
Easement EMT A on SP158697	Newly impacted (0.06 ha). Low impact anticipated crossing easement	Established and on going
Easement EMT F on SP193830	Alignment change only (similar area of impact)	Established and on going
Lot 25 on SP130068 Rail Corridor	Alignment change only (similar area of impact)	Established and on going
Lot 2 on SP214498 'Daunia Station'	Alignment change only (similar area of impact)	Established and on going

Table 2-3 East of Moranbah Alignment Change (127.2 to 131.7km) - land impacts and consultation status

Impacted Property or Easement	Description of impact	Consultation status
Lot 1 on SP192459 'Watonga'	Alignment change only (similar area of impact)	Established and on going
Easement EMT GV66	Alignment change only (similar area of impact). Low impact with pipeline crossing under powerlines	Established and on going
Easement EMT A on GV203	Newly impacted (0.06 ha). Low impact with pipeline to cross under existing pipeline	Established and on going
Easement EMT N on GV198,	Newly impacted (0.17 ha). Low impact easement crossing	Established and on going
Lot 16 on CPGV133 Orica	Alignment change only (similar area of impact).	Established and on going
Easement EMT H on GV177	Newly impacted (0.07 ha). Low impact with pipeline crossing under existing pipeline	Established and on going



ROUTE CHANGE CO-ORDINATES

ID	Easting	Northing
1	638339.014	7575187.963
2	639149.499	7574856.482
3	639625.857	7574664.737
4	645823.408	7577984.990
5	648333.518	7579562.971
6	649101.122	7579974.236
7	650985.083	7580505.478

Document: T:\Asset Solutions\SW-Connors River Dam and Pipelines\P-ASWP-0034-AA-01 Moranbah to Alpha Pipeline\Drawings\PDF\Route Change Coppabella.mxd
Printed: Wednesday, February 9 2011 10:20:25 AM

REVISION	DATE	REMARKS	CKD	PSD

MAP INFORMATION
Coordinate System: MGA94 Zone 55

N

SCALES (A3 SIZE)
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DRAWN: AJN
DESIGNED:
CHECKED:
CHECKED:
APPROVED:

SunWater
©SunWater Limited
ACN 131 034 985

CONNORS TO MORANBAH PIPELINE
COPPABELLA REALIGNMENT
Figure 2-2

CONTRACT NUMBER
DRAWING NUMBER: Route Change Coppabella
DATE: DEC 2010

2.2.2. Consultation with Traditional Owners

SunWater has been consulting with the registered Native Title claimants (Barada Barna) for the Project regarding alignment changes. Barada Barna have been advised of the post EIS alignment changes during recent Indigenous Land Use Agreement (ILUA) negotiations. This ILUA has now been agreed and was authorised on 27 November 2010. Further consultation of site specific impacts have been undertaken with Barada Barna delegates (Barada Barna manage the Hamilton Park grazing property (Lot 4 on WHS 354) affected by the Dennison Creek crossing realignment). Further consultation around cultural heritage clearances associated with the realignment and required investigations took place between SunWater and Woora Consulting (the Aboriginal Party) on 22 November 2010 at Woora Consulting's offices in Farleigh. This meeting addressed the future need to undertake additional clearance work along the pipeline route as agreed in the Project's registered Cultural Heritage Management Plan (CHMP).

2.3. Terrestrial flora and fauna assessment

An assessment was undertaken to examine the potential impacts of the refined alignment. The amended preferred pipeline options are shown in Figure 2-3, Figure 2-4 and Figure 2-5 respectively. The assessment reviewed changes in ecological impacts of the new alignment compared to the previous alignment assessed in the EIS. The assessment utilised the following data sources:

- DERM Regional Ecosystem Mapping Version 6.0
- DERM Essential Habitat Mapping Version 3.0
- EPBC Protected Matters Search Tool
- DERM Wildlife Online Database
- 3D Consultants Connors River Pipeline Ground Truthed RE Mapping

Areas of each Regional Ecosystem potentially impacted were calculated using GIS by buffering the proposed and EIS pipeline alignments by 30 m (15 m either side of the centreline). Vegetation mapping datasets used for calculations were 3D Consultants ground truthed mapping for the EIS alignment and a combination of 3D Consultants mapping and DERM V6.0 RE mapping where ground truthed map coverage was not available.

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11.8.11
11.8.5/11.8.11
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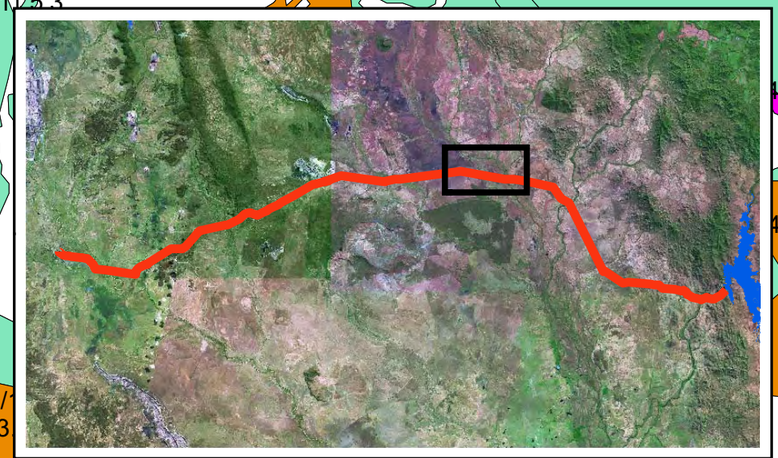
11.4.9
11.8.11
11.3.25
11.3.3/11.3.4/11.3.25
11.3.2
11.4.9/11.3.4
11.3.10
11.4.13
11.3.1
11.4.8
11.4.2/11.4.9



LEGEND

- Supplementary Alignment
- 500m buffer
- High Value Regrowth
- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Not Of Concern
- Non-remnant / regrowth

Projection: GDA 1994 - Zone 55

Figure 2 - 3

0 250 500 1,000
Metres

Scale 1:50,000 (A4)

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SunWater Making Water Work

SKM

CONNORS RIVER DAM AND PIPELINES

Regional Ecosystems - DCC

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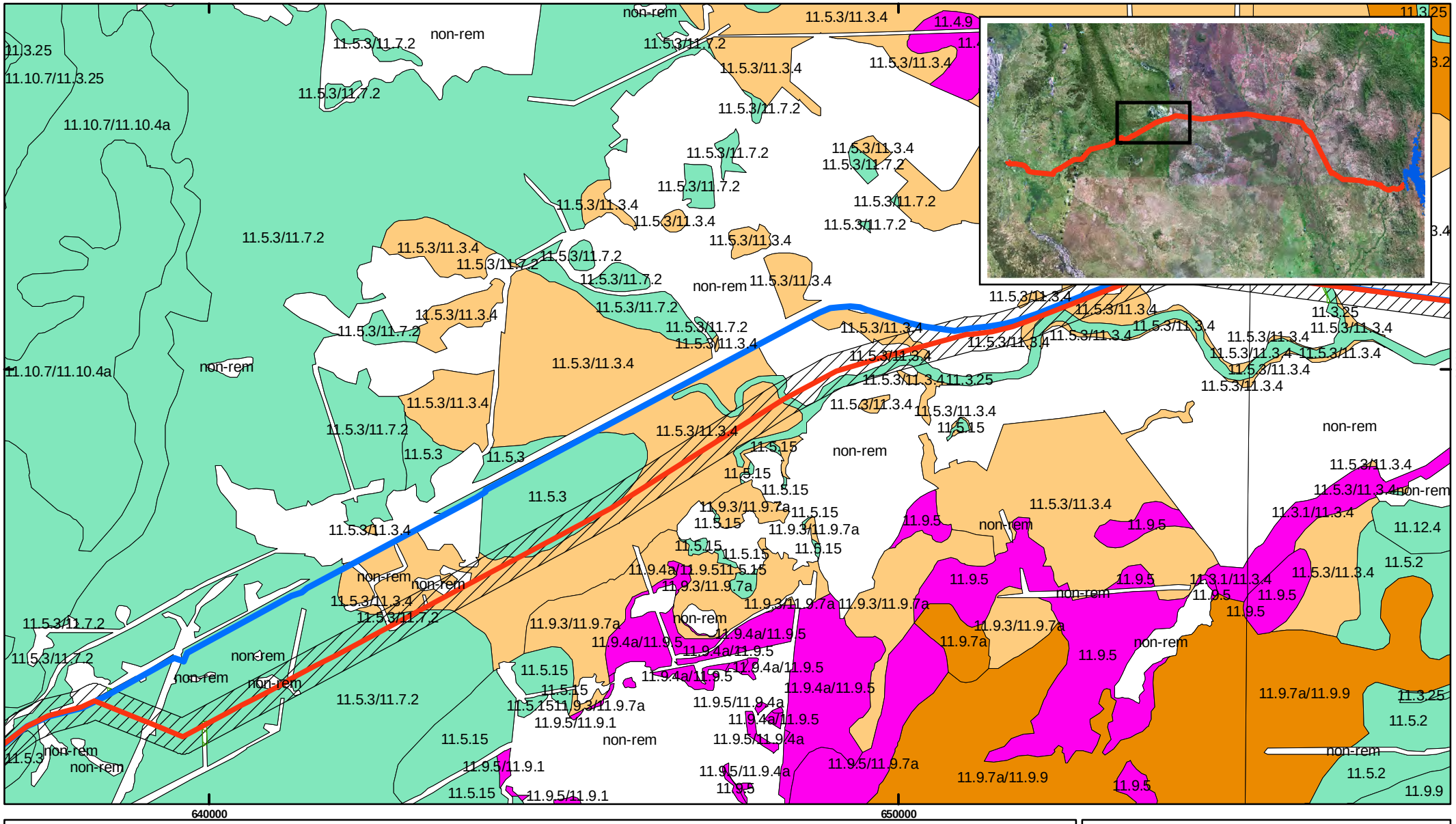

LEGEND

- Supplementary Alignment
- 500m buffer
- High Value Regrowth
- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Not Of Concern
- Non-remnant / regrowth

Projection: GDA 1994 - Zone 55

Figure 2 - 4

0 250500 1,000

Metres

Scale 1:75,000 (A4)

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SunWater Making Water Work

SKM

CONNORS RIVER DAM AND PIPELINES

Regional Ecosystems - Coppabella

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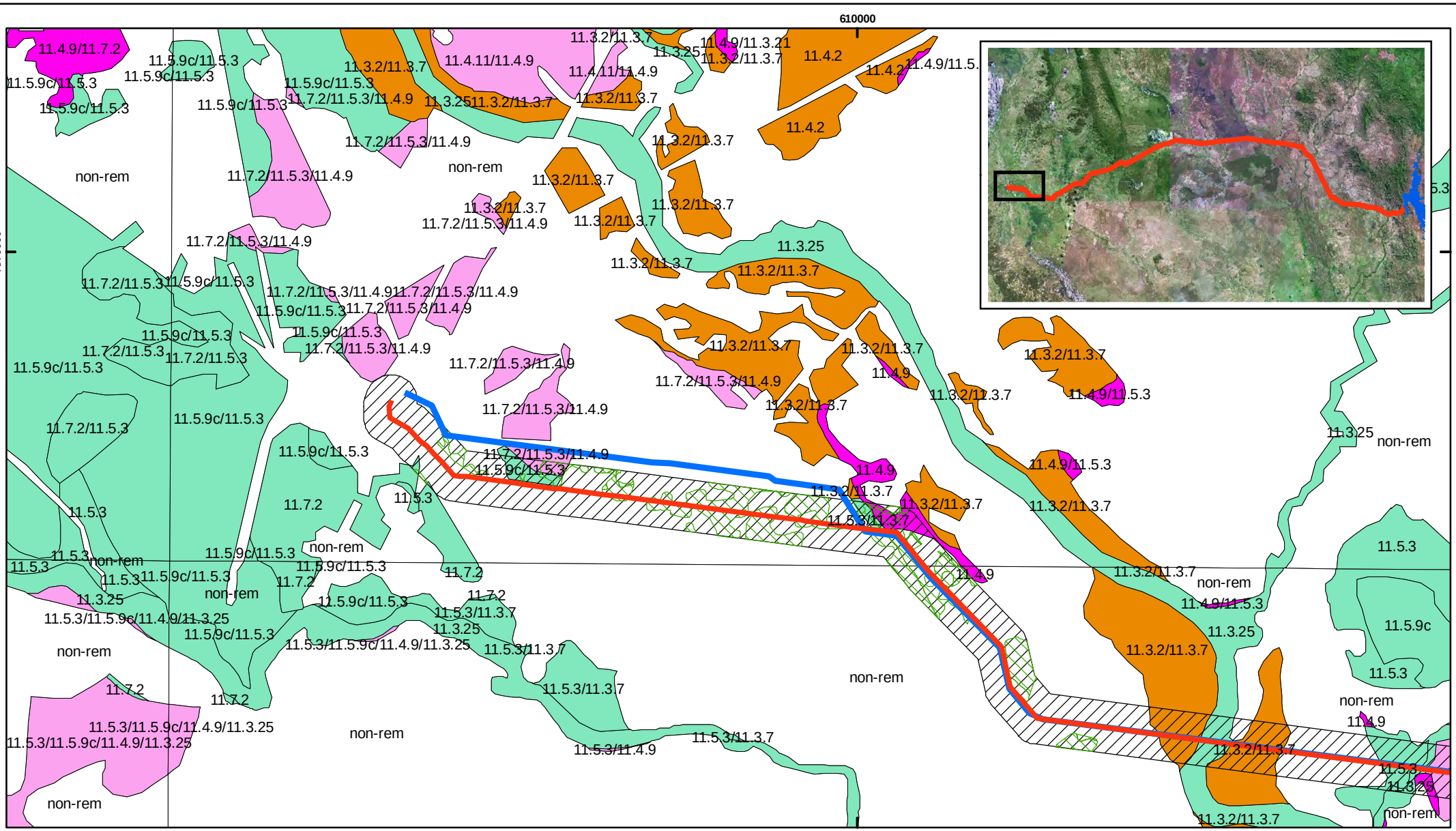

LEGEND

- Supplementary Alignment
- 500m buffer
- High Value Regrowth
- Endangered - Dominant
- Endangered - Sub-dominant
- Of Concern - Dominant
- Of Concern - Sub-dominant
- Not Of Concern
- Non-remnant / regrowth

Projection: GDA 1994 - Zone 55

Figure 2 - 5

0 250 500 1,000

Metres

Scale 1:50,000 (A4)

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SunWater Making Water Work

SKM

CONNORS RIVER DAM AND PIPELINES

Regional Ecosystems - Moranbah

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2.3.1. Denison Creek Crossing realignment

The proposed alignment will impact an additional 1.57 ha of RE 11.3.3/11.3.4/11.3.25 which is Of Concern Dominant and an additional 2.99 ha of RE 11.3.2.

The changes in vegetation impacts are described in detail within Table 2-4.

2.3.1.1. EPBC Act listed ecological communities

The study identified two endangered REs occurring within the DCC realignment. RE 11.4.9 *Acacia harpophylla* shrubby open forest to woodland comprises the Brigalow EEC listed under the EPBC Act. The proposed realignment will reduce impacts by 0.03 ha on RE 11.4.9. The new alignment will also reduce impacts on RE 11.3.1 (also comprises the Brigalow EEC), by 0.15 ha.

The new alignment will impact an additional 0.67 ha of high value regrowth. High value regrowth under the VM Act is regrowth that has not been cleared since 1989. While the regional ecosystem of the Endangered regrowth is not provided by DERM, based on the proximal regional ecosystems it has the potential to include Brigalow *Acacia harpophylla* dominant or co-dominant regrowth or possibly semi evergreen vine thicket regrowth.

The Australian Government Brigalow (*Acacia harpophylla* dominant and co-dominant) information sheet states that any brigalow regrowth in Queensland that is more than 15 years old that retains the species composition and structural elements typical of that found in undisturbed areas of the listed Brigalow ecological community are part of the EPBC listed Brigalow ecological community. Hence high value endangered regrowth in this area may form part of the Brigalow EPBC Endangered Ecological Community.

Table 2-4 summarises the approximate impacts to REs and EPBC threatened ecological communities.

Table 2-4 Changes to REs and communities impacted - DCC

					Area to be cleared (ha)		
RE	**Short Description**	**EPBC Act**	**VM Act Status**	**Biodiversity Status**	**EIS Pipeline (ha)**	**Refined Pipeline (ha)**	**Difference (ha)**
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Endangered	Endangered	Endangered	0.80	0.65	-0.15
11.3.2	*Eucalyptus populnea* woodland on alluvial plains		Least Concern	Of concern	1.04	4.03	2.99
11.3.10	*Eucalyptus brownii* woodland on alluvial plains		Least Concern	No concern at present	2.70	2.23	-0.47
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines		Of Concern	Of concern	0.51	0.72	0.21
11.3.3/11.3.4/ 11.3.25	*Eucalyptus coolabah* woodland on alluvial plains, *Eucalyptus tereticornis* and/or Eucalyptus spp. tall woodland on alluvial plains and *Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines		Of Concern/ Of Concern/ Least Concern	Of concern	7.06	8.63	1.57
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	Endangered	Endangered	0.33	0.30	-0.03
Total Remnant					12.43	16.56	4.13
Endangered Regrowth					0	0.67	0.67
Total Non-remnant					16.39	11.98	-4.41

2.3.1.2. Threatened flora species

The DCC realignment will impact an additional 0.21 ha for RE 11.3.25 which is considered potential habitat for the EPBC and NC Act Vulnerable *Eucalyptus raveretiana* and may increase impacts on this species if is present in the area. It was not found during EIS field surveys of the adjacent dam and surrounds area. Pre clearing surveys will be conducted to determine if this species is present.

It is important to note that while assessed in the EIS, *Aponogeton queenslandicus* has been delisted from the NC Act as of 21 May 2010 and as such is no longer a threatened flora species.

2.3.1.3. Threatened fauna species

Impacts on fauna species are likely to be similar to the EIS pipeline alignment with a possible increased impact on Brigalow dependent reptile species due to increased clearing of high value endangered regrowth that may support Brigalow. Mitigation measures recommended within the EIS for previous alignments are still relevant.

2.3.2. Coppabella realignment

The assessment of the realigned pipeline found that no new REs would be impacted. Of the four REs impacted, one has a VM status of Of Concern while two have a Biodiversity status of Of Concern. No EPBC threatened ecological communities or Endangered remnant vegetation were mapped along this alignment. Table 2-5 compares the clearing impacts for the EIS assessed pipeline and the refined pipeline route.

Table 2-5 Changes to REs and communities impacted - Coppabella

				Area to be cleared (ha)		
RE	**VM Act Class**	**Biodiversity Status**	**Short Description**	**EIS Pipeline (ha)**	**Refined Pipeline (ha)**	**Difference (ha)**
11.3.25	Least Concern	Of Concern	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	0.55	1.08	0.52
11.5.3	Least Concern	No Concern at Present	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* woodland on Cainozoic sand plains/remnant surfaces.	12.51	18.25	5.73
11.5.3/11.3.4	Least Concern / Of Concern	No Concern at Present / Of Concern	*Eucalyptus populnea* ± *E. melanophloia* ± *Corymbia clarksoniana* woodland on Cainozoic sand plains/remnant surfaces and *Eucalyptus tereticornis* and/or *Eucalyptus spp*. tall woodland on alluvial plains	0.00	10.47	10.47
11.3.4a	Of Concern	Of Concern	*Corymbia tessellaris* woodland on alluvial plains.	2.96	1.89	-1.07
Total Remnant				16.03	31.68	15.65
Non-remnant				26.68	10.99	-15.69

The increased clearing of remnant vegetation results from the need to shift from adjacent to an existing road and easement to a less developed area.

2.3.2.1. Threatened fauna species

Impacts on fauna species are likely to be similar to the previous pipeline alignment though there is greater likelihood of encounter given the higher proportion of intact vegetation. Mitigation measures recommended for previous alignments are still relevant.

2.3.3. Moranbah realignment

One Endangered (VM and Biodiversity status) RE was recorded within the Moranbah realignment with the remainder being Least Concern / No Concern at Present. Table 2-6 compares the clearing impacts for the EIS assessed pipeline and the refined pipeline route. The total impact on remnant vegetation decreases from 2.13 ha to 0.80 ha, a reduced impact of 1.33 ha. A further 1.57 ha increase in non-remnant vegetation is also recorded.

2.3.3.1. EPBC Act listed ecological communities

RE 11.4.9 *Acacia harpophylla* shrubby open forest to woodland is mapped within the realignment which comprises the Brigalow EEC listed under the EPBC Act. Brigalow also occurs in association with RE 11.4.8. The proposed realignment will impact on 0.19 ha of the mapped remnant community, an increase of 0.19 ha as the Brigalow EEC listed community was not impacted on under the previous alignment.

Table 2-6 Changes to REs and EPBC listed ecological communities impacted - Moranbah

				Area to be cleared (ha)		
RE	***VM Act Class***	***Biodiversity Status***	***Short Description***	**EIS Pipeline (ha)**	**Refined Pipeline (ha)**	**Difference (ha)**
11.5.3	Least Concern	No Concern at Present	*Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces	2.07		-2.07
11.7.2	Least Concern	No Concern at Present	*Acacia spp*. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	0.07		-0.07
11.4.9/11.4.8	Endangered	Endangered	*Acacia harpophylla* shrubby open forest to woodland with Terminalia oblongata on Cainozoic clay plains and Eucalyptus cambageana woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains		0.19	0.19
11.5.3/11.5.9c	Least Concern	No Concern at Present	*Eucalyptus crebra* and other *Eucalyptus spp*. and *Corymbia spp*. woodland on Cainozoic sand plains/remnant surfaces and *Eucalyptus crebra + Corymbia intermedia + E. moluccana + C. dallachiana* woodland.		0.61	0.61
Total Remnant				2.13	0.80	-1.33
Endangered Regrowth				0.02	0.02	<0.01
Total Non-remnant				13.76	15.32	1.57

2.3.3.2. Essential Habitat

There is one essential habitat record outside of the proposed pipeline realignment to the west of Moranbah in remnant vegetation that is unlikely to be affected by the project.

2.3.3.3. Threatened flora species

Impacts on flora species are likely to be similar to the previous pipeline alignment. Mitigation measures recommended for previous alignments are still relevant.

2.3.3.4. Threatened fauna species

Impacts on fauna species are likely to be similar to the previous pipeline alignment. Mitigation measures recommended for previous alignments are still relevant.

3. DAM RELATED CHANGES

The originally proposed stepped spillway has been replaced by a smooth spillway. This will reduce impacts to fauna, particularly fish and turtles that may be washed over the spillway during flood events.

4. QUARRY INVESTIGATION AREAS

Construction materials, preferably sourced locally, will be required for RCC and conventional concrete, access roads and hauls roads, earth embankments, erosion protection and other similar applications. Preliminary geotechnical investigations undertaken during the EIS phase identified three potentially suitable sites. It was stated in Section 2.2.3.2 of the EIS that precise details of the materials to be used for construction will be determined and optimised during the detailed design phase of the Project and as such some changes to actual source locations (of rock) may occur through investigation.

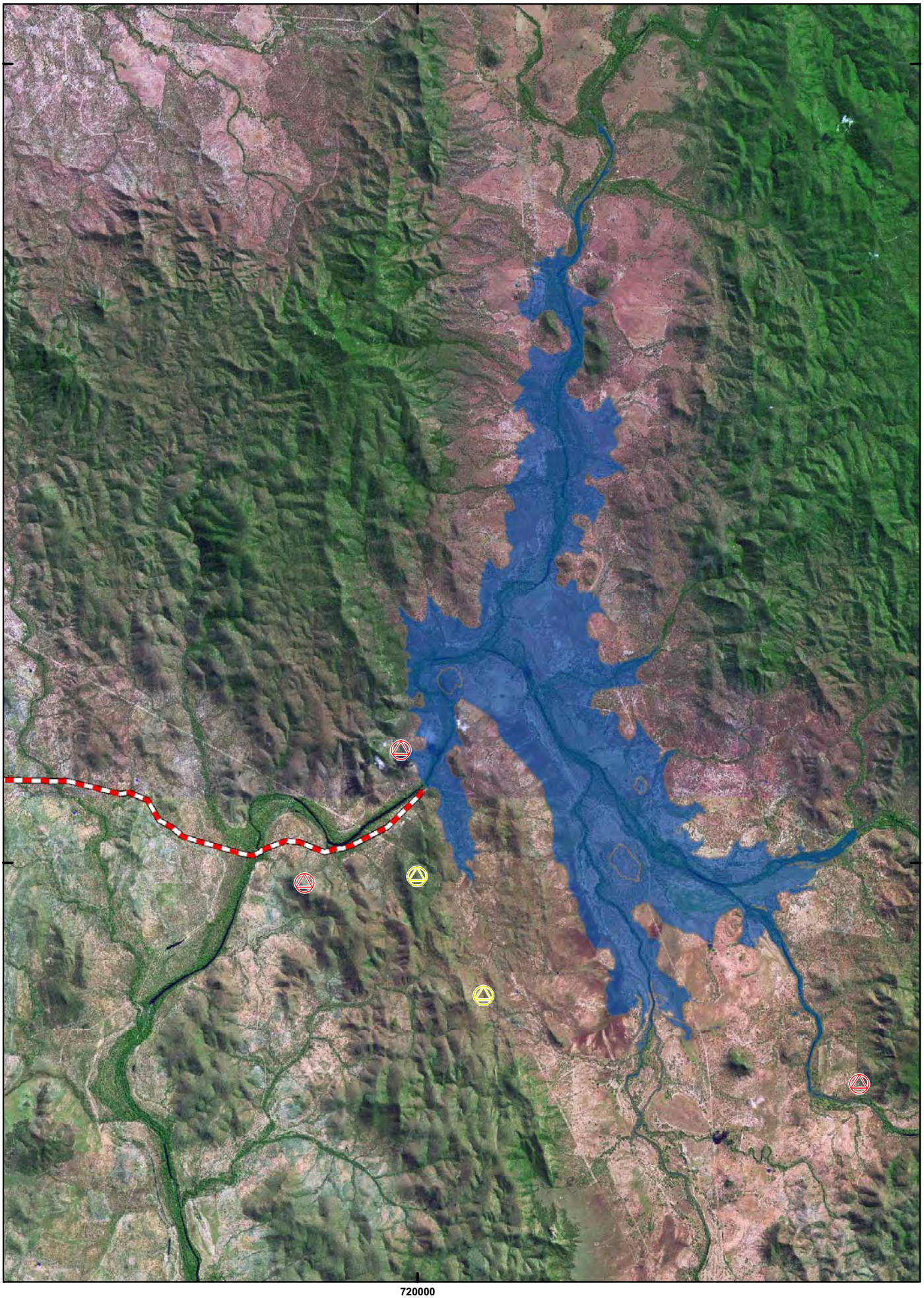
Since submission of the EIS, additional geotechnical investigations have been undertaken and identified potentially more suitable rock quarry sites (considered to contain higher quality resources) within close vicinity to the dam wall. Figure 4-1 provides a comparison of quarries investigated during the EIS and Supplementary phases of the Project.

Three potential locations for hard rock quarries were identified during the EIS phase; one near the right abutment of the dam wall, one near Mt Bridget and one on the Marylands property. Since submission of the EIS, geotechnical investigations have confirmed sites within close proximity to the original investigation areas located at the right abutment of the dam wall and on Marylands property remain suitable as potential rock quarries.

As part of the additional geotechnical investigations undertaken within the Mt Bridget region, more suitable locations have been identified which exist on west Marylands property and the east of the Doreen property (Figure 4-1). No additional properties would be impacted with the amendment to quarry locations.

Based on geotechnical investigations, the right abutment area of the dam wall currently remains the preferred site for primary extraction of material though the potential for this to change with detailed investigations exists. As sites are all within the construction area proposed to be closed to traffic, altering the location will have no impact on traffic beyond the construction area. Similarly as there are no nearby sensitive receivers, impacts related to noise or air quality do not alter significantly from that presented in the EIS.

Impacts to terrestrial flora have been assessed through desktop analysis followed up by field survey (Appendix D-7). Based on field survey, the vegetation of the supplemental sites (Snowfields) is comprised primarily of RE 11.12.1, RE11.12.2, small areas of RE11.12.4 plus non-remnant vegetation. The remnant vegetation all has a VM status of Least Concern and a Biodiversity status of No Concern at Present. No threatened ecological communities or species were found during field surveys but one species listed under the NC was thought likely to occur (*Cerbera dumicola*, which also occurs at the dam wall site) while two listed under the NC Act (*Eucalyptus reveritiana* and *Actephila sessiliflora*) and one listed under the EPBC Act (*Eucalyptus reveritiana*) were thought possible occurrences. If these species are confirmed as present during pre-construction surveys then mitigation and offset strategies as discussed in the EIS and SEIS will apply.



LEGEND

- EIS Quarry Sites
- Preferred Pipeline Alignment
- Supplementary Quarry Sites
- Full Supply Level (169.1m AHD)

Projection: GDA 1994 - Zone 55

Figure 4-1

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SunWater Making Water Work

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CONNORS RIVER DAM AND PIPELINES SUPPLEMENTARY REPORT

Quarry Investigation Areas

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5. LAND PURCHASE STRATEGY

The EIS noted that the land purchase strategy would be finalised based upon impacts of inundation, severance, access and potential for inclusion within an environmental offset strategy. The latter is discussed in Appendix D-4. Assessments of severance and access have also been finalised.

The land purchase strategy aimed to maintain viability of existing farming operations where possible and to minimise the cost of associated infrastructure needed to maintain such operation. The access and environmental offset strategies were therefore developed in unison and via an iterative approach.

Given the direct impact of inundation and the indirect impact on access and power, full purchase of Collaroy and Ridgelands was always viewed as essential. Hence once the offset requirement of the Project was estimated (acknowledging the need to confirm the requirement with applicable agencies) the availability of offsets on these properties was identified. Undercliff is the next most impacted property and while full purchase is a consideration, because access to the north was maintained it may be feasible to continue limited grazing. The available offsets on Undercliff were then assessed and added to those on Ridgelands and Collaroy.

Deacey and Mountain View were found to contain little if any of the offsets required by the Project. Deacey is owned by the same landholder who owns the adjacent Marylands property. Marylands is impacted to an extent by inundation but its operation would be severely constrained by loss of access to the north and west. Upon review of the remaining offsets needed, of the offsets available on Marylands and of the cost of providing new access to the property, it was determined that partial purchase related to inundation, provision of the new access and attaining of covenants on specific areas of suitable offset would be SunWater's preferred approach as this maintained the viability of all three properties with respect to their current use while still providing some of the offsets needed by the Project.

In summary, SunWater's land purchase strategy for the Project is currently as follows:

- Undercliff: full purchase and partial management for environmental offset purposes with a strong likelihood of leaseback for limited grazing use.
- Ridgelands: full purchase and management for environmental offset purposes though it may be possible to arrange a limited grazing lease with the lessee of the adjoining Undercliff should a similar agreement be possible on that property.
- Collaroy: full purchase and management for environmental offset purposes though it may be possible to arrange a limited grazing lease with the owner of the adjoining Marylands property.
- Marylands: partial acquisition to the flood margin with negotiated covenants for offset purposes on specific areas of land. Acquisition of the potential quarry site by a reconfiguration of Marylands creating a separate lot for that quarry site, together with associated access to that lot. Provision of a new 14.2 km access road joining Connors River Collaroy Rd (Part C).
- Doreen: the property is partially impacted by the dam wall and inundation and this portion of the property will be acquired. The remainder of the property will be heavily impacted by access road upgrades and the need to secure various areas of permanent and temporary tenure to construct and operate the project (including the potential need for negotiated covenants for offset purposes on specific

areas of land). Commercial negotiations with the Doreen landowner will be requested in early 2011 to establish a mutually agreeable outcome.

- Deacey and Mountain View: acquisition not necessary. Access secured by the new road.

REFERENCES

A.P. Berghuis and C.D Broadfoot (QFS within DPI) 2004, *Downstream Passage of Fish at Ned Churchward Weir*, Queensland Government, Queensland.

Australian Standards 1428.1 – 2001 *Design for Access and Mobility,* Standards Australia Ltd.

Biosecurity Primary Industries & Fisheries Queensland, (represented within DEEDI) 2010, *Annual Pest Distribution Maps*, Queensland Government, Queensland.

Biosecurity Primary Industries & Fisheries Queensland, (represented within DEEDI) 2010, *Predictive Pest Maps*, Queensland Government, Queensland.

Brisbane City Council (date unavailable) *Ecological Assessment Guidelines,* Brisbane.

Department of Environment and Conservation DEC New South Wales, *Threatened species profiles*. Viewed 01-11-10 http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10275

Department of Environment and Resource Management, 1999, *Water Resource (Fitzroy Basin) Plan*, Queensland Government, Queensland.

Department of Environment and Resource Management (DERM) 2009*, Policy for Vegetation Management Offsets,* Queensland Government, Queensland.

Department of Environment and Resource Management (DERM) 2009, *Draft Policy for Biodiversity Offsets,* Queensland Government, Queensland.

Department of Environment and Water Resources (DEW) 2007 *Use of Environmental Offsets Under the Environment Protection and Biodiversity Conservation Act 1999.* Department of the Environment and Water Resources Discussion Paper, Australian Government.

Department of Local Government and Planning /Department of Emergency Services (DLGP/DES) 2003, *State Planning Policy 1/03: Mitigation the Adverse Impacts of Flood, Bushfire and Landslide*, Queensland Government, Queensland.

Department of Natural Resources and Water (DNRW) 2006 *Fitzroy Basin Water Resource Operations Plan*, Department of Natural Resources and Water, Queensland.

Department of the Sustainability, Environment, Water, population and Communities (2010, accessed 1/11/2010). *EPBC Protected Matters Database* (-21.95584,147.9878, -22.04982,147.9991, -22.04803,148.1596, -21.97009,148.1545).

Department of Transport and Main Roads 2006, *Guide Assessment of Road impacts of Development (GARID)*, Queensland Government, Queensland.

Environmental Protection Agency (EPA) 2007, *Regional Ecosystem Description Database (REDD),* (version 5.1) Queensland Government, Queensland.

Environmental Protection Agency (EPA) 2008, *Queensland Government Environmental Offsets Policy (QGEOP),* Queensland Government, Queensland.

Environmental Protection Agency (2009). *Regional Ecosystem Description Database (REDD).* Version 6.0. Updated November 2009. Database maintained by Queensland Herbarium, Environmental Protection Agency, Brisbane.

Environmental Protection Agency (2010). *Wildnet* (-21.95584,147.9878, -22.04982,147.9991, -22.04803,148.1596, -21.97009,148.1545).

Environmental Protection Agency (2010). *Regional Ecosystem and Essential Habitat Map*

(-21.9934, 148.0565 point)

Environmental Protection and Biodiversity Conservation Act 1999, Australian Government, Canberra.

Fisheries Act 1994, Queensland Government, Queensland.

Food Act 2006, Queensland Government, Queensland.

IECA (Australasia) 2008, *Best practice erosion and sediment control,* International Erosion Control Association (Australasia).

International Panel for Climate Change (IPCC), 2006, *Guidelines for National Greenhouse Gas Inventories*, Volume 4: Agriculture, Forestry and Other Land Use.

Land Protection (Pest and Stock Route Management) Act 2002, Queensland Government, Queensland.

Limpus, C, Limpus, D, Parmenter, C, Hodge, J, Forrest, J, and McLachlan, J, 2007, "*Proposal for raising Eden Bann Weir and construction of Rookwood Weir – An Assessment of the Potential Implications and Mitigation Measures for Fitzroy Turtles*." Queensland Environmental Protection Agency.

Mineral Resources Act 1989, Queensland Government, Queensland.

Nature Conservation Act 1992, Queensland Government, Queensland.

Petroleum and Gas (Production and Safety) Act 2004, Queensland Government, Queensland.

State Development and Public Works Organisation Act 1971, Queensland Government, Queensland.

Threatened Species Scientific Committee 2008,. *Commonwealth Conservation Advice on Eucalyptus raveretiana.* [Online]. Department of the Environment, Water, Heritage and the Arts. Available from:http://www.environment.gov.au/biodiversity/threatened/species/pubs/16344-conservation-advice.pdf.

Transport Infrastructure Act 1994, Queensland Government, Queensland.

Vegetation Management Act 1999, Queensland Government, Queensland.

Water Act 2000, Queensland Government, Queensland.

Personal Communications

Limpus, C. 2009, Personal Communications, Department of Environment and Resource Management.