

9.4.4 Survey Limitations

Climatic Conditions

The average daily minimum temperature during the fauna survey was 21 OC, whilst the average daily maximum was 28.4°C. Data from the Gold Coast Seaway Automatic Weather Station (AWS) indicated that 168.4mm of rain fell in coastal districts during the first week of the fauna survey, whilst less than 5mm fell during the second week. Supplementary data from the Springbrook Road Weather Station indicated that 681mm rain fell during the month of February. Both temperature and rainfall data indicated that the fauna survey was completed during an ideal survey period with warm, wet days during the first week of survey (ideal for amphibian survey) and warm, dry days during the second week (better conditions for all other groups).

Seasonality

A late summer/autumn field survey program may have undersampled a suite of cryptic flora species which are only obvious during flowering in spring and early summer.

In relation to fauna, altitudinal winter migrants are likely to have been undersampled, although they comprise a relatively minor percentage of the expected fauna assemblage. Summer latitudinal migrants such as Channel-billed Cuckoo, Dollarbird and Common Koel were adequately sampled.

General Survey Approach

The survey approach has several well recognised limitations. Firstly it assumes a single pass through an area, so that the intention is not to gain a complete or even nearly complete inventory of the flora or fauna at a site. From a fauna point of view, it is anticipated that species generally typical of the plant association will be found. Also, given the single pass approach, it is likely that local weather conditions will affect the activity levels and ‘observability’ of species meaning that some common species will be missed, and some rare ones will be found.

A second shortcoming of the vertebrate fauna survey is that the time spans are too brief to allow the gathering of quantitative as well as qualitative data. Thus there are no reasonable estimates possible for any population sizes of any fauna species.

Some quantitative data was gathered for significant flora, enabling course estimates of population sizes across the study area.

9.5 Potential Impacts

9.5.1 Nature and Extent of Impacts

The impacts of the Project will occur in the short-term and over the long-term. The short-term impacts are those which will occur as a direct result of the construction and operation of the Project, while the long-term impacts will occur over a more extended period of time (in the order of years).

The short-term impacts include:

- the loss of remnant and regrowth vegetation and habitat as a result of vegetation clearing for construction of the dam wall and associated infrastructure/facilities and within the area below the the proposed FSL (“inundation area”);
- disturbance to fauna from construction activities, noise and vibration;
- traffic related wildlife mortality on roads within and around the Project area; and
- spread of weeds into cleared and disturbed areas.

The long-term impacts include:

- the loss of remnant vegetation and habitat within the inundation area that has not been cleared during construction;
- infrequent and temporary inundation of remnant vegetation and habitat during flood events;
- reduction of riparian vegetation along the upper reaches of the dam at Nerang River and Little Nerang Creek leading to the reduced opportunity for the movement of wildlife along the watercourses;
- gradual changes in flora composition immediately above the proposed FSL;
- further fragmentation of the landscape affecting flora connectivity and fauna movement;
- change in the flow and flooding regime downstream of the dam resulting in changes in the distribution of riparian vegetation along the banks of the Nerang River below the dam; and
- potential for increased proliferation of exotic species, including weeds and pests.

The assessment of impacts on terrestrial flora and fauna is based on the key features of the Project which comprise:

- permanent inundation of the area above the current FSL of the dam (82.2m AHD) up to the proposed FSL of 94.5m AHD;
- temporary inundation of the area up to the 1 in 100 year ARI and Probable Maximum Flood (PMF) levels;
- the dam footprint;
- construction site works, including site office, crib huts, heavy equipment workshops, storage/stockpile areas and haul routes;
- establishment of the quarry and clay borrow areas;
- roadworks for the realignment of a section of the Gold Coast-Springbrook Road east of Little Nerang Creek (bridge);
- embankment treatments and extension to culverts at locations along the Nerang-Murwillumbah Road and the western end of Gold Coast-Springbrook Road;
- construction of Pocket Road bridge at the upper reach of Nerang River;
- reconfiguration of the two existing boat ramps off the eastern and western arms of the dam;
- development of recreational facilities, including boat ramps, picnic areas, toilets and tracks.

9.5.2 Construction Impacts

Loss of Remnant Vegetation and Essential Habitat

Construction of the dam, saddle dams and associated facilities and road infrastructure will require the clearing of both non-remnant and remnant vegetation (including essential habitat) within the study area. The areas of regional ecosystems and essential habitat to be impacted by the construction activities and road infrastructure are provided in

For the purposes of this assessment, impacts relating to the clearing of vegetation within areas to be permanently inundated by the proposed FSL have been assessed under operational impacts.

Dam Footprint

The footprint of the main dam and saddle dams largely extends over land that has already been disturbed and developed as a result of Stages 1 and 2 of Hinze Dam. Raising of the dam wall and construction of a stability berm will impact on scattered non-remnant vegetation downstream of the dam including the Koala food tree plantation, which will need to be relocated.

The footprint of the saddle dam encroaches on the south-western border of a patch of RE 12.11.5, resulting in the clearing of approximately 0.46 ha during construction. This disturbance is minimal and is not expected to have any significant impacts on flora and fauna.

Furthermore, infrastructure works will be required for the upgrade of upper intake tower. These works will be limited to the disturbed areas surrounding the upper intake tower, which have previously been cleared of remnant vegetation.

Construction Areas

The construction site activities will be concentrated within previously disturbed and cleared areas surrounding the dam wall to avoid additional impacts on ecological values. This includes the site office, crib huts, heavy equipment workshops and storage/stockpile areas.

Quarry/Clay Borrow Areas

It is intended that construction materials for the Project be sourced on-site wherever possible. This will require the expansion of the existing quarry (west of the existing spillway), and establishment of a clay borrow pit between Gilston Road and the existing rangers office. The area proposed for the clay-borrow pit is comprised of non-remnant vegetation. However, the quarry expansion will result in the clearing of approximately 0.67 ha of remnant vegetation, predominantly comprising RE 12.11.5.

Table 9-19 and

Table 9-20 and shown on **Figure 9-10** and **Figure 9-11**.

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■ **Table 9-19 Areas of RE's and Essential Habitat Impacted by Construction Works**

Regional Ecosystem	Area (ha) impacted by the dam construction						Total Area (ha)
	Dam footprint	Clay Borrow	Quarry	Buildings	Haul road	Recreation areas	
12.11.3	-	0.07	0.136	-	-	-	0.206
12.11.5	0.46	-	5.534	0.07	0.18	-	6.244
Non-remnant	12.03	5.94	2.206	2.41	3.60	3.23	29.416
Disturbed	0.04	-	-	0.08	0.88	0.05	1.05
Essential Habitat	0.46	-	5.53	0.07	0.18	-	6.24
Total (remnant)	12.99ha	6.01ha	13.406ha	2.63ha	4.84ha	3.28ha	43.156ha

■ **Table 9-20 Areas of RE's and Essential Habitat Impacted by the Road Infrastructure**

RE	Area (ha) impacted by the associated infrastructure			Total Area (ha)
	Boat ramp	Pocket Rd bridge	Little Nerang Rd realignment	
12.3.7	-	0.086	0.05	0.136
12.11.3	0.12	0.043	-	0.163
12.11.5	0.53	-	-	0.53
Non-remnant	0.03	-	1.02	1.05
Disturbed	1.2	-	0.18	1.38
Essential Habitat	0.65	0.13	0.05	0.83
Total (remnant)	2.53ha	0.259ha	1.3ha	4.089ha

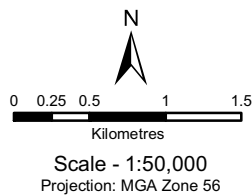
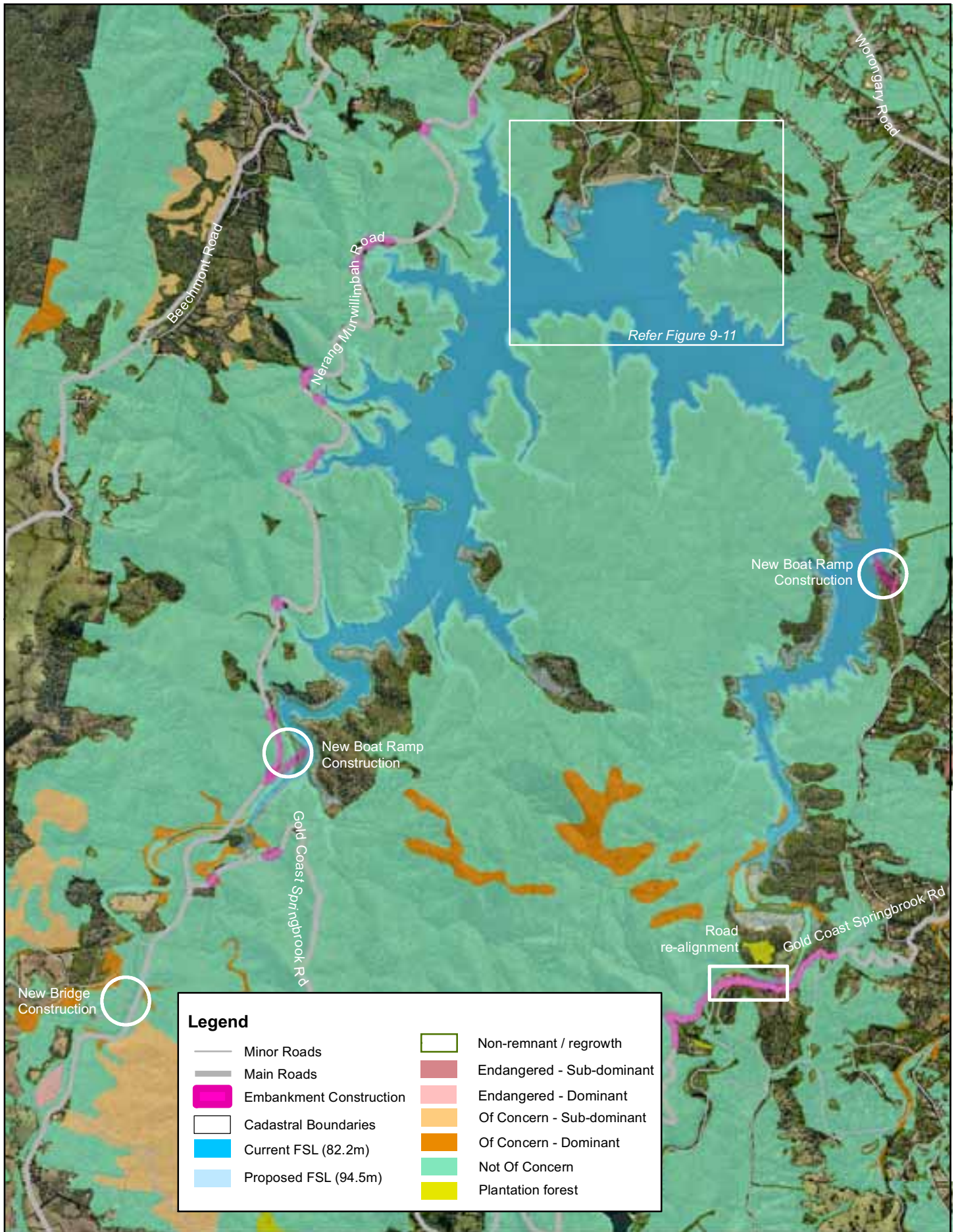
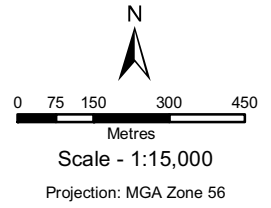


Figure 9-10
Infrastructure/Road Impacts
on Remnant Vegetation
Hinze Dam Stage 3 EIS



- Legend**
- Intake tower
 - Roads
- Regional Ecosystem**
- Non-remnant/ regrowth
 - Of Concern - Dominant
 - Not Of Concern
 - Proposed FSL (94.5m)

Figure 9-11
Impacts of Inundation
(to FSL) on
Remnant Vegetation

Recreational Areas

The proposed recreational areas are clustered around the dam wall and consist of the lakeside park, interpretive centre / amenities, downstream park and outdoor recreation and mountain bike area.

The lakeside park is will be located on a rehabilitated site (recontoured spoil from the proposed quarry expansion) within the existing quarry. The area has been highly disturbed from past quarrying activities and vegetation comprises of non-remnant acacia regrowth with areas of exposed rock. Clearing of non-remnant vegetation will be required to establish the lakeside park, as well as the interpretive centre immediately north of the park. The development of these recreational areas will not have any significant impacts on terrestrial flora and fauna, and the proposed landscaping is expected to provide a positive contribution to the current ecological status of the area.

Further recreation areas are proposed immediately north and east of the dam wall. The downstream park will be re-instated after disturbance from construction site activities. The proposed clay borrow area will be rehabilitated after extraction of the clay and form part of the outdoor recreation area. These recreation areas will provide a positive contribution to the ecological status of the area post-construction through the provision of native landscaping.

Road Infrastructure

1. Embankment Treatments

Embankment protection and extension to culverts is proposed to the existing embankments located on the Nerang-Murwillumbah Road at the following locations:

- Beliss Creek;
- Black Shoot Gorge;
- Burns Creek;
- Arkinstalls Gorge;
- Southern end of Nerang-Murwillumbah Road (north of the Nerang River bridge); and
- Two locations on the western end of the Gold Coast-Springbrook Road

The works required to stabilise the embankment consist of a rock berm or gabion wall built up to the height of the 1 in 100 year ARI flood line on the eastern (dam facing) side of the embankment. Works will be contained within areas previously disturbed during the construction of the existing embankments. These areas are currently considered to be covered by non-remnant vegetation. However, natural regeneration has occurred since construction and these areas now provide habitat for a variety of birds, including the vulnerable Glossy-black Cockatoo and the rare Red-browed Treecreeper. The Glossy-black Cockatoo was observed feeding on She-oak (*Allocasuarina littoralis*) on the embankment at Burns Creek, and the Red-browed Treecreeper was observed at the Arkinstalls Gorge embankment.

Vegetation on the eastern (dam facing) side of the embankments will be disturbed to build up the rock berm/ gabion wall and provide access to transport materials down the embankment slope. The loss of these small areas of non-remnant vegetation will lead to a minor reduction in the availability of feeding resources for birds. The majority of the birds observed are relatively common and widespread across the Gold Coast region, and the extensive areas of open eucalypt forest within the study area support similar habitat. As such the minor habitat loss associated with proposed embankment treatments is considered unlikely to compromise the viability of local populations of any species.

It is not anticipated that the loss of food trees for the Glossy Black Cockatoo at the Burns Creek embankment will have a significant impact on this species. This Glossy-black Cockatoo is highly mobile and She-oak is abundant across the study area. Furthermore, given time the embankments will develop a cover of native vegetation which is likely to contain the preferred feed trees of this species.

2. Road Realignment

Roadworks for the proposed vertical realignment (raising) of the Gold Coast-Sringbrook Road will commence 250m east of the bridge across Little Nerang Creek and will extend for a length of 700m eastwards. The corridor proposed for the road realignment generally follows the existing road reserve and there are no areas of remnant vegetation within or directly adjoining the corridor.

3. Pocket Road Bridge

The construction of the Pocket Road bridge over Nerang River off Nerang-Murwillumbah Road, upstream of the Nerang River arm of the dam, will impact on riparian vegetation alongside the creek. The bridge will be parallel to and north of the existing wooden structure to allow continued access throughout construction and will span approximately 60 metres in length and 10.8 metres in width.

The area of impact is expected to be an approximately 10m wide corridor extending from the existing Nerang-Murwillumbah Road to join with the existing Pocket Road on the western side of the creek. Approximately 0.129 ha of remnant vegetation will be cleared to accommodate the bridge, comprising of 0.086 ha of open eucalypt forest (RE 12.11.3) and 0.043 ha of riparian forest (RE 12.3.7) within the creek. Given time, riparian vegetation will regenerate on the edges of the cleared area where the level of light is sufficient to allow regeneration. This small area of impact is not considered to have a significant impact on the extent of these regional ecosystems in the study area.

The new bridge will also result in the shading of riparian and in-stream vegetation in the area under and adjacent to the bridge. Effects are expected to be minor, as the area affected by the new bridge is small, and will not be permanently overshadowed. Furthermore, the existing wooden structure will be decommissioned once construction of the new bridge is complete.

The endangered Giant Barred Frog is known from this reach of the Nerang River. Impacts on this species are assessed in **Appendix C**.

4. Upstream Boat Ramps

The upgrade of the eastern and western upstream boat ramps will involve the provision of new concrete ramps, sealed access road and parking, toilet facilities and associated landscaping.

The footprint of the eastern boat ramp extends through an area of previously disturbed vegetation that is currently mapped as non-remnant, however the western edge of the boat ramp encroaches on vegetation (consistent with RE 12.11.3) that is approaching remnant status.

The footprint of the western boat ramp is slightly smaller than the eastern boat ramp and impacts on both remnant and non-remnant vegetation communities, and will result in the clearing of approximately 0.12 ha of RE 12.11.3 and 0.53 ha of RE 12.11.5.

Vegetation surveys of the proposed boat ramp footprints found the vegetation to be representative of RE 12.11.3. The flora species are commonly found throughout the study area, and no rare or threatened species were observed. The vegetation is not protected for its nature conservation value, and thus construction of the boat ramps is not expected to have any significant ecological impacts.

Construction Noise

Noise and vibration from the construction and quarrying activities, in particular near the dam wall, may have a short-term detrimental affect on local fauna inhabiting the area. This could cause additional stress, causing animals to leave their home ranges, disruption to breeding cycles and restrictions in foraging behaviour. The construction activities will be concentrated around the dam wall, and it is expected that mobile fauna would temporarily shift into nearby habitat during working hours. Less mobile species would be more significantly affected by noise and vibration, however, the majority of terrestrial fauna (other than birds) are nocturnal and daily activity patterns are considered unlikely to be compromised.

Weeds

There is potential for disturbance to existing weed infested areas, in particular around the edges of the current FSL, and spread of declared weeds during construction and vegetation clearance. The potential for this to occur will be minimised by adherence to a weed management plan (see **Section 9.7** for details).

9.5.3 Operational Impacts

Loss of Remnant Vegetation

The raising of the Hinze Dam FSL will result in the inundation of land situated above the current full supply level. The Project involves both permanent inundation (to allow additional water storage) and temporary inundation (for flood mitigation and dam safety). There are essentially three potential inundation scenarios, namely inundation to the:

- new Full Supply Level (FSL) of 94.5m AHD;
- level reached by a flood of frequency of 1 in 100 year ARI; and
- level reached by a theoretical Probable Maximum Flood (PMF).

A large proportion of the area to be permanently inundated at the proposed FSL (approximately 300 ha) will be cleared of vegetation. Clearing will be undertaken from the current FSL to the proximity of the proposed FSL. Where vegetation is not cleared it is assumed (for the purposes of this assessment) that it will be lost as a result of permanent inundation, although this may not necessarily be the case. Clearing will be prioritised as follows:

- areas containing EVR flora taxa will not be subject to mechanical clearing works;
- riparian ecosystems adjacent to Little Nerang Creek and the Nerang River will not be cleared;
- areas of high visual impact will be cleared as a high priority (these areas do not contain EVR flora).

As impacts associated with the 1 in 100 year ARI flood and PMF flood events would be highly infrequent, it is not intended that vegetation be cleared within these extents. Theoretically, the 1 in 100 year ARI flood event will occur (on average) once every 100 years and modelling results estimate that it would take approximately three days from the onset of the storm for inundation to reach the peak level of 101.03m AHD, after which it would take approximately four days to return to the FSL. The PMF is the theoretical maximum flood level that could ever occur and has a probability of greater than 1 in 5 000 000.

Given the temporary and infrequent nature of these events, impacts on terrestrial flora and fauna are not considered to be significant. Vegetation could withstand a periodic inundation of up to four days in the event of a 1 in 100 year ARI event, and although vegetation may suffer damage from currents and temporary flooding, it is considered likely to recover.

The Project will require approximately 318 ha of mapped remnant vegetation to be cleared and/or flooded below the proposed FSL, to enable permanent inundation for the water storage. Of this total area, approximately 21ha consists of Of Concern and 297ha consists of Not of Concern regional ecosystems. No endangered regional ecosystems will be affected. The regional ecosystems represented in the inundation area and areas to be impacted by the proposed FSL are provided in **Table 9-21** and shown on **Figure 9-3** and **Figures 9-3a to 9-3c**.

■ **Table 9-21 Areas of Regional Ecosystems Impacted by the Inundation Area**

Regional Ecosystem	VMA Status	Area (ha)
12.11.1	Not of Concern	1.51
12.11.3	Not of Concern	92.48
12.11.3/12.11.1	Not of Concern	10.73
12.11.5	Not of Concern	170.36
12.3.7	Not of Concern	22.59
12.3.11	Of Concern	13.15
12.3.2	Of Concern	7.52
Total		318.34

The removal and flooding of remnant vegetation within the inundation area will further reduce the area of habitat available for both flora and fauna that occur within the study area. Furthermore, inundation to the proposed FSL will also cause degradation to remnant vegetation on newly created edges or banks as a result of edge effects. Edge effects are likely to include changes to the micro climate (hotter temperature, changes to humidity, increased light availability and wind exposure), increased predation and weed invasion. It is not known how far these edge effects will extend beyond the proposed FSL; however it is expected that weeds will establish in newly created edges further degrading the remaining remnant vegetation.

Vegetation offsets are being proposed to compensate vegetation loss and these are discussed in **Section 9.6**.

Loss of Essential Habitat

The loss of remnant vegetation will also result in the loss of essential habitat for the Koala, Tusked Frog and several rare and threatened flora species. The areas of essential habitat to be impacted on by the proposed FSL are provided in **Table 9-22**. It should be noted that these areas are included within the loss estimates for regional ecosystems, and are not additional areas of impact.

■ **Table 9-22 Areas of Essential Habitat Impacted by the Inundation Area**

Essential Habitat - Species	Regional Ecosystems	Area (ha)
Koala (<i>Phascolarctos cinereus</i>)	RE 12.11.1	1.42
Tusked frog (<i>Adelotus brevis</i>)		
<i>Plectranthus nitidus</i>	RE 12.11.3	25.22
Rusty oak (<i>Helicia ferruginea</i>)		
<i>Pararistoclochia praevenosa</i>	RE 12.11.5	170.36
Smooth scrub turpentine (<i>Rhodamnia maideniana</i>)		
Long-leaved tuckeroo (<i>Cupaniopsis newmanii</i>)	RE 12.3.7	22.59
Rusty vine (<i>Marsdenia hemiptera</i>)		
Silverleaf (<i>Argophyllum nullumense</i>)	RE 12.3.11	13.15
Brush cassia (<i>Cassia marksiana</i>)		
	RE 12.3.2	7.44
Total		240.18

All of the species listed in the essential habitat mapping are known to inhabit the inundation area and were observed during the field surveys. Thus essential habitat for these species will be lost as a result of inundation to the proposed FSL. Vegetation offsets are proposed to compensate habitat loss and are discussed in **Section 9.6**.

Loss of Riparian Vegetation

A significant impact of the dam will be the loss of riparian vegetation, both directly from flooding to the proposed FSL, and indirectly as a result of changes to flow regime downstream. Further flooding of Nerang River and Little Nerang Creek will occur upstream of the existing impoundment up to the Koala Feed Tree Plantations. This will result in the inundation of an approximate length of 8.6 km of natural watercourse supporting approximately 43 ha of remnant riparian vegetation communities, as detailed in **Table 9-23**.

■ **Table 9-23 Riparian Forests Inundated at the Proposed FSL**

Watercourse	Riparian/Alluvium Forests and Woodlands	RE	VMA Status	Area inundated at FSL (ha)
Little Nerang Creek/Nerang River	Tall Open Forest (<i>Casuarina cunninghamiana</i>)	12.3.7	NOC	22.59
Little Nerang Creek	Tall Open Forest (<i>Eucalyptus grandis</i>)	12.3.2	OC	7.52
Nerang River	Tall Open Forest (<i>E. tereticornis</i> / <i>E. siderophloia</i> +/- vineforest understorey)	12.3.11a	OC	13.15
Total				43.26

Upstream of the dam, communities of Queensland Blue Gum and Northern Grey Ironbark tall open forest (RE 12.3.11a) fringe the banks of Nerang River and relict patches of Flooded Gum tall open forest (RE 12.3.2) occur close to Little Nerang Creek. RE 12.3.11a and 12.3.2 are both classed as Of Concern under the VMA, and inundation to the proposed FSL will result in the loss of the majority of these two vegetation communities occurring along the length of the watercourses to be impacted. With the impact of additional edge effects the survival of these communities along the sections of Little Nerang Creek and Nerang River to be flooded is not considered likely.

Such an impact is significant at a regional scale due to the loss of the Of Concern regional ecosystems, and at a local scale, with the opportunity for the movement of fauna across the watercourses being reduced with the fragmentation and loss of riparian habitat along the upper reaches of Nerang River and Little Nerang Creek.

Impacts on Significant Flora

Nineteen (19) flora species of conservation significance known to occur within the inundation area and will either be cleared during the initial Project stages or will be flooded at full supply level. These species are:

- *Acacia orites* (Mountain wattle) – rare (NCA);
- *Archidendron muellerianum* (Veiny leaf flower) – rare (NCA);
- *Argophyllum nullumense* (Silverleaf) – rare (NCA);
- *Beyeria lasiocarpa* – rare (NCA);
- *Brunoniella spiciflora* – to be listed as near threatened (NCA);
- *Cassia marksiana* (Brush Cassia) – rare (NCA);
- *Cupaniopsis newmanii* (Long-leaved tuckeroo) – rare (NCA);
- *Helicia ferruginea* (Rusty oak) – Rare (NCA);
- *Lepiderema pulchella* Fine-leaved tuckeroo – rare (NCA);
- *Macadamia integrifolia* (Qld nut) – V (EPBC/NCA);
- *Macadamia tetraphylla* (Rough-shelled Bush Nut) – V(EPBC/NCA);

- *Marsdenia hemiptera* (Rusty vine) – rare (NCA);
- *Owenia cepiodora* (Onion wood)-V (EPBC/NCA);
- *Pararistolochia praevenosa* (Richmond birdwing butterfly vine) -R (NCA);
- *Randia moorei* (Spiny gardenia) -E (EPBC/NCA);
- *Rhodamnia maideniana* (Smooth scrub turpentine) -R (NCA);
- *Senna acclinis* (Rainforest cassia) -R (NCA);
- *Symplocos harroldii* (Hairy hazelwood) -R (NCA); and
- *Plectranthus nitidus*- E (EPBC/NCA).

The potential impacts on the rare and threatened fauna that were identified as known occurrences in the study area are presented in **Table 9-24**.

■ **Table 9-24 Potential Impacts on Significant Flora**

Species	Potential Impact
Endangered	
Spiny Gardenia (<i>Randia moorei</i>)	<p>Spiny Gardenia occurs in several discrete populations comprised of an estimated 1521 individuals. These plants occupy an area of approximately 9ha, at an estimated density of 165 plants per hectare.</p> <p>Initial clearing activities across the Project area will exclude areas of habitat known to contain this species, such that the ultimate loss of individuals will be determined by the impact of inundation to the proposed full supply level.</p> <p>It is envisaged that 15-20% of the area by Spiny Gardenia in the study area occupied (and total number of observed individuals) will be impacted by inundation in the long term, with the subsequent loss of 250-300 individuals of this species.</p>
<i>Plectranthus nitidus</i>	<p><i>Plectranthus nitidus</i> occurs as a single population of approximately 50 plants in a very small area of less than 1000m².</p> <p>Initial clearing activities across the Project area will exclude areas of habitat known to contain this species, such that the ultimate loss of individuals will be determined by the impact of inundation to the proposed full supply level.</p> <p>It is currently envisaged that 100% of the area occupied by <i>Plectranthus nitidus</i> in the study area will be impacted by inundation in the long term, with the subsequent loss of up to 50 individuals of this species</p>
Vulnerable	
Queensland Nut (<i>Macadamia integrifolia</i>)	<p><i>Macadamia integrifolia</i> hybrid is restricted to two areas with a total population of less than 10 plants. Initial clearing activities across the Project area will exclude areas of habitat known to contain this species, such that the ultimate loss of individuals will be determined by the impact of inundation to the proposed full supply level.</p> <p>It is envisaged that up to 100% of the area occupied by Bush Nut in the study area will be impacted by inundation in the long term, with the subsequent loss of up to 10 individuals of this species.</p>
Rough-shelled Bush Nut (<i>Macadamia tetraphylla</i>)	<p>Rough-shelled Bush Nut occurs in four patches with an estimated total population of 80 individuals. The <i>Macadamia tetraphylla/integrifolia</i> hybrid is restricted to a single patch. Initial clearing activities across the Project area will exclude areas of habitat known to contain this species, such that the ultimate loss of individuals will be determined by the impact of inundation to the proposed full supply level.</p> <p>It is envisaged that up to 80% of the area occupied by Rough-shelled Bush Nut in the study area will be impacted by inundation in the long term, with the subsequent loss of up to 64 individuals of this species.</p>
Onion Cedar (<i>Owenia cepiodora</i>)	<p>Onion Cedar occurs in several discrete patches, with a total population of approximately 237 plants over an area of approximately 9ha.</p> <p>Initial clearing activities across the Project area will exclude areas of habitat known to contain this species, such that the ultimate loss of individuals will be determined by the impact of inundation to the proposed full supply level.</p> <p>It is currently envisaged that 15-20% of the area occupied by Onion Cedar in the study area will be impacted by inundation in the long term, with the subsequent loss of up to 30-40 individuals of this species.</p>

Species	Potential Impact
Rare	
Mountain Wattle (<i>Acacia orites</i>)	This species is very restricted in its occurrence, and was present at only two flora survey site, within Regional Ecosystem 12.11.1. There will be no impact on the individuals recorded from the study area, although additional individuals may be present and may be lost.
Veiny Laceflower (<i>Archidendron muellerianum</i>)	Approximately 50 individuals of this species were recorded primarily from the Nerang River reach of the dam in Regional Ecosystem 12.11.3. There may be the loss of a small number of individuals of this species.
Silverleaf (<i>Argophyllum nullumense</i>)	This species is prolific within Regional Ecosystem 12.11.3 across the study area, with over 400 individuals recorded from flora survey sites. There will be a loss of and estimated 500-1000 individuals of this species.
<i>Beyeria lasiocarpa</i>	This species is very restricted in it's occurrence, and was present at only one flora survey site, within Regional Ecosystem 12.11.1. A small number of individuals of this species may be impacted by the proposal.
<i>Brunoniella spiciflora</i>	This species is prolific within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with several hundred individuals recorded from flora survey sites. An unknown number of individuals of this species will be lost as a result of the Project.
<i>Carronia multiseplaea</i>	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 50 specimens recorded from flora survey sites. It is assumed that approximately 50% of these plants will be lost as a result of the proposal.
<i>Callerya australis</i>	This species is restricted in its occurrence across the study area, with 11 specimens recorded from Regional Ecosystem 12.3.7 in the riparian zone of Little Nerang Creek. All known individuals of this species will be lost under the proposal, however, additional specimens are likely to be present upstream and outside of the impact area.
Brush Cassia (<i>Cassia marksiana</i>)	This species is restricted in its occurrence across the study area, with less than 20 specimens recorded from Regional Ecosystem 12.11.3. The majority of individuals recorded appear to be located at or above the FSL.
Long-leaved Tuckeroo (<i>Cupaniopsis newmanii</i>)	This species is prolific within Regional Ecosystem 12.11.3 across the study area, with over 1000 individuals recorded from flora survey sites. There will be a loss of an estimated 1500 individuals of this species.
Rusty Oak (<i>Helicia ferruginea</i>)	This species is restricted in its occurrence across the study area, with less than 10 specimens recorded from Regional Ecosystem 12.11.1. All recorded individuals of this species will be lost.
Fine-leaved Tuckeroo (<i>Lepiderema pulchella</i>)	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 80 individuals recorded from flora survey sites. Records from the study area represent a minor range extension for this species. It is envisaged that up to 50% of individuals recorded during field surveys will be lost.
<i>Marsdenia hemiptera</i>	This species is restricted in its occurrence across the study area, with less than 10 specimens recorded from Regional Ecosystem 12.11.1. All recorded individuals of this species will be lost.
<i>Pararistolochia praevenosa</i>	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 50 specimens recorded from flora survey sites. It is envisaged that a substantial number of individuals will be lost as a result of the proposal.
Smooth Scrub-turpentine (<i>Rhodamnia maideniana</i>)	This species is common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 400 specimens recorded from flora survey sites. It is estimated that at least 600 specimens will be lost as a result of the proposal.
<i>Senna acclinis</i>	This species is restricted in its occurrence across the study area, with less than 10 specimens recorded from Regional Ecosystem 12.11.3. The majority of individuals recorded appear to be located at or above the FSL.
Hairy Hazelwood (<i>Symplocos harroldii</i>)	This species is relatively common within Regional Ecosystems 12.11.1 and 12.11.3 across the study area, with over 80 specimens recorded from flora survey sites. Records from the study area represent a range extension for this species. The majority of plants are located above the FSL and will not be impacted by the proposal.

Impacts on Significant Fauna

The inundation of remnant vegetation up to the proposed FSL will also cause the loss of habitat for fauna species of conservation significance. This will both reduce the size of habitat area for wildlife and cause further fragmentation of habitat upstream of the dam leading to the reduced movement of fauna across Nerang River and Little Nerang Creek.

The potential impacts on the rare and threatened fauna as known or possible inhabitants of the study area are presented in **Table 9-25**.

■ Table 9-25 Potential Impacts on Significant Fauna

Species	Potential Impact
Endangered	
<i>Phyllodes imperialis</i>	This species has not been observed within the study area, although the preferred larval food plant (<i>Carronia multiseppalea</i>) occurs at several sites. There will be a loss of a number of individuals of <i>Carronia multiseppalea</i> as a result of inundation up to FSL. Subsequently there will be a loss of potential larval development sites for <i>Phyllodes imperialis</i> .
Giant Barred Frog (<i>Mixophyes iteratus</i>)	This species is known to have occurred historically at Pocket Road Bridge, which will be subject to construction works (construction of a new bridge). The area downstream of the bridge has been extensively modified by vegetation restoration works, and the area upstream is heavily weed invaded. It is not known whether the species persists at this site, however, a range of management practices can be implemented to reduce impacts.
Vulnerable	
Richmond Birdwing Butterfly (<i>Omithoptera richmondiana</i>)	This species has not been observed within the study area, although the preferred larval food plant (<i>Pararistolochia praevenosa</i>) is relatively abundant. There will be a loss of a number of mature individuals of <i>P. praevenosa</i> as a result of inundation up to FSL. Subsequently there will be a loss of potential larval development sites for the Richmond Birdwing Butterfly.
Glossy-black Cockatoo (<i>Calyptorhynchus lathami</i>)	The Glossy-black Cockatoo was observed throughout the study area during the field surveys. Food trees for the Glossy-black Cockatoo (<i>Allocasuarina littoralis</i> and <i>Allocasuarina torulosa</i>) are abundant across the study area, mainly in disturbed areas (i.e. road reserves, existing quarry, dam shoreline). This species is highly mobile, and loss of habitat from inundation is unlikely to have a significant impact on the feeding resources of this species. Potential nest sites which consist of large hollow bearing trees, will also be lost, although the species is known to select nest sites away from forest edges, and the number of potential nest sites within the impact area is considered to be relatively low.
Swift Parrot (<i>Lathamus discolor</i>)	The Swift Parrot was not detected during the field survey, however the species may forage in the study area, particularly where <i>Eucalyptus tereticornis</i> or other winter-flowering species occur. It is not anticipated that the loss of open forest habitat as a result of inundation would have a significant impact on the Swift Parrot, as this species is highly mobile and similar open forest habitat is abundant across the area.
Australian Painted Snipe (<i>Rostratula australis</i>)	The Australian Painted Snipe was not detected during the field survey, however this species may utilise shallow vegetated wetland habitat along the dam shoreline, and the upper reaches of the dam. It is not anticipated that inundation of this habitat would have a significant impact on the Australian Painted Snipe, if present, as this species could continue to make use of the wetland habitat created by the new water supply.
Lewin's rail	Lewin's rail was not detected during the field survey, however this species may utilise the vegetated margins of Advancetown Lake. It is not anticipated that inundation of this habitat would have a significant impact on the Lewin's rail, if present, as this species could continue to make use of the wetland habitat created by the new water supply.
Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>)	The Grey-headed Flying Fox is commonly encountered in the Gold Coast region. The eucalypt forests that occur across the study area provide foraging habitat for this species. It is not anticipated that the loss of the foraging habitat as a result of inundation to the proposed FSL will have a significant impact on the Grey-headed Flying Fox, as this species is highly mobile and can forage on eucalypt forests abundant in the area. Furthermore, there are no camps located within the proposed inundation area.
Brush-tailed Rock Wallaby (<i>Petrogale penicillata</i>)	A known population of the Brush-tailed Rock Wallaby inhabits the rocky area of Pages Pinnacle. This area not be affected by the Project, and therefore no impact to this species is anticipated.
Koala (<i>Phascolarctos cinereus</i>)	Although only a single individual was observed during the fauna survey program, the Koala is known to utilise open eucalypt forest across the study area (there is widespread evidence of their occurrence). Essential habitat for this species within the study area includes REs 12.3.2, 12.3.7, 12.3.11, 12.11.3 and 12.11.5. Raising the dam will result in the loss of approximately 306 ha of essential habitat for the Koala through either clearing or flooding, which is anticipated to have a moderate impact on this

Species	Potential Impact
	<p>species at the local level. The nature of habitat loss (linear strips of vegetation along existing edges of habitat patches) reduces the magnitude of impacts somewhat, because relatively extensive and unfragmented tracts of vegetation will remain.</p> <p>It is recommended that spotter/catchers are employed during clearing of the inundation area to ensure Koalas are not harmed. Koalas are expected to naturally migrate during flooding of the inundation area.</p>
Spotted-tail Quoll (<i>Dasyurus maculatus</i>)	The Spotted-tail Quoll was not detected during the field survey, however the species may utilise habitats within the study area, including rainforest and open eucalypt forest. The nature of habitat loss (linear strips of vegetation along existing edges) reduces the magnitude of impacts somewhat, because relatively extensive and unfragmented tracts of vegetation will remain which are suitable for this species.
Tusked Frog (<i>Adelotus brevis</i>)	The Tusked Frog was recorded from fringing vegetation around Advancetown Lake and Little Nerang Creek. Inundation of these areas is likely to have an impact on this species. However, impacts are not anticipated to be significant as the Tusked Frog is fairly ubiquitous in southeast Queensland and is likely to recolonise grass communities that will establish around the edges of the new water supply.
Three-toed Snake-tooth Skink (<i>Coeranoscincus reticulatus</i>)	The Three-toed Snake-tooth Skink was not detected during the field survey, however this species may inhabit small areas of rainforest habitat within sheltered gullies. There will be a loss of potential habitat for this species due to inundation of RE's 12.11.1 and 12.11.3, which provide potential habitat for this species.
Rare	
Grey Goshawk (<i>Accipiter novaehollandiae</i>)	The Grey Goshawk was observed in the study area and it is likely that this species utilises wet sclerophyll and rainforest habitat within the study area. The raising of the dam will result in the loss of approximately 105 ha of suitable habitat for this species. It is not anticipated that this reduction in habitat will be significant as the Grey Goshawk is highly mobile and can exploit other vegetation types in the area.
Sooty Owl (<i>Tyto tenebricosa</i>)	The Sooty Owl was observed within the study area in riparian forest dominated by Flooded Gum. The inundation of the majority of this vegetation community type in the study area (approximately 7.52 ha) will have a moderate impact on this species. However, this species is likely to continue to utilise other remnant patches of rainforest and wet sclerophyll forest surrounding the proposed FSL.
Red-browed Tree-creeper (<i>Climacteris erythrops</i>)	The Red-browed Tree-creeper was observed from several locations across the study area, primarily associated with Brushbox and Flooded gum dominated open forests. The raising of the dam will result in the inundation of the majority of the Flooded Gum open forest in the study area (approximately 7.52 ha). However impacts are not considered to be significant as this species is likely to continue to utilise patches of wet sclerophyll forest outside of the proposed FSL.
Black-chinned Honey-eater (<i>Melithreptus gularis</i>)	The Black-chinned Honeyeater was recorded from the Birds Australia Atlas but is not known from the study area. If present, this species is likely to utilise the dry eucalypt forests widespread in the study area. The raising of the dam will result in the inundation of approximately 170 ha of dry eucalypt forest (RE 12.11.5). This species is largely sedentary so any loss of habitat within its range will reduce the carrying capacity of habitat for this species.

Impacts on Matters of National Environmental Significance

The Terms of Reference for an Environmental Impact Statement (EIS) under Part (4) of the *Queensland State Development and Public Works Organisation Act 1971* specifically requires that:

“A stand-alone report addressing the matters of NES should be provided as an appendix to the EIS that exclusively and fully addresses the issues relevant to the controlling provisions.”

A report has been prepared to satisfy this requirement and is included as **Appendix C**.

Habitat Fragmentation

The existing inundation to create Advancetown Lake has already caused extensive loss of remnant vegetation within the valleys of Nerang River and Little Nerang Creek, and fragmentation of the landscape across these watercourses. The raising of the dam will result in the further loss of remnant vegetation around the current FSL, and additional fragmentation will be experienced at the upper reaches of the dam, where extended flooding of Nerang River and Little Nerang Creek will inhibit connectivity of riparian vegetation and habitat across these watercourses.

Under the present conditions, Nerang River and Little Nerang Creek are fairly narrow and allow for the movement of fauna across the watercourses using rocks and overhanging vegetation. The permanent inundation of these watercourses will result in a reduction in the movement of fauna, particularly mammals and reptiles, across Nerang River and Little Nerang Creek, at the upper reaches of the dam. However, the length of additional watercourses to be inundated is short (approximately 4km each), and fluctuating water levels at the upper reaches of the proposed inundation area, will continue to allow opportunities for the movement of fauna across the watercourses.

Connectivity is significant from a flora perspective for fertilisation and pollination, transportation of reproductive material by animals, insects and birds and the dispersal of seeds by water and wind. The further inundation of Nerang River and little Nerang Creek upstream of the dam will reduce the dispersal capability of some species in the catchment, particularly those restricted to the immediate riparian zone. However, dispersal pathways for such species have already been interrupted by Advancetown Lake, which inundated substantial lengths of both the Nerang River and Little Nerang Creek.

The raising of the FSL along Nerang River is expected to have minimal impact on the declared State Wildlife Corridor.

Downstream Impacts

Changes in the flow and flooding regimes experienced in the Nerang River below the dam could potentially impact on downstream riparian vegetation if flows are significantly reduced. Flood mitigation is already provided by Hinze Dam, and further changes to the environmental flows are not expected to impact on existing riparian vegetation downstream of the dam. Furthermore, the environmental flow objectives will be in accordance with the Gold Coast Water Resource Plan and will take into account the need to protect aquatic ecosystems downstream of Hinze Dam.

9.5.4 Summary and Conclusions

This survey has recorded a large number significant flora species from the study area, including nationally significant populations of several species which were previously unknown (or poorly documented) from the locality. Searches for these species have extended well beyond the immediate impact area of the Project and subsequently the overall body of knowledge relating to the distribution, abundance and ecology of these species has increased markedly.

The discovery and description of previously unrecorded populations of a suite of EVR flora taxa presents a unique (and previously unavailable) opportunity to promote their conservation and recovery. The loss of a relatively minor proportion of the total populations of some species within the study area can be offset by the management of retained habitat (particularly the management of weeds and fire) and efforts to increase the size of populations through propagation and planting.

The Project will result in the loss of approximately 340 ha of remnant vegetation and 180ha of regrowth/cleared lands for the areas to be permanently inundated (up to the proposed FSL). With respect to rare or threatened flora and fauna listed under the NCA and EPBC, the Project has the potential to result in significant impacts by the loss of habitat on the following species:

- *Randia moorei*;
- *Owenia cepiodora*;
- Bush Nut and Rough-shelled Bush Nut;
- *Symplocos harroldii*;
- Giant Barred Frog;
- *Phyllodes imperialis*; and
- Richmond Birdwing Butterfly

9.6 Proposed Mitigation Measures

Mitigation measures that have been recommended to minimise impacts of construction and operation of the Project are listed below. These measures have been developed in recognition of the impacts likely to be caused by the Project.

9.6.1 Design

During the optimisation phase of the Project many options for the dam design were investigated, with Full Supply Levels varying from 92.5 m AHD to 96 m AHD. The selection of the preferred option considered the potential impacts on remnant vegetation and habitat around the lake as one of the assessment criteria.

Several recreational precincts have been proposed for the Project. Recreational areas will be landscaped with local native species as a priority and will act to rehabilitate those areas that were disturbed during construction, including the clay borrow pit, the dam wall construction and the existing quarry.

9.6.2 Construction Phase

Vegetation Management

This section outlines the recommended measures to minimise potential impacts on vegetation within and adjacent to construction zones and includes measures to ensure the identification and demarcation of vegetation to be retained; installation of vegetation protection measures and vegetation management strategies prior to, during and following site preparation works. The following strategies will be employed prior to and during construction works:

- identification of areas within the inundation area that are to be cleared and/or retained on Construction Drawings;
- avoidance of impact on remnant vegetation outside the inundation area by clearly identifying the FSL boundary, and directing contractors to avoid these areas;
- boundaries of areas to be retained to be clearly marked by tape and/or pegs and conform to limits on drawings;
- contractor to monitor vegetation clearing to ensure only approved areas are cleared;
- avoidance of damage to root zones of adjacent trees during construction – locate vehicle access, material storage and the cleaning of plant and equipment away from adjacent trees, where possible;
- salvage of topsoil from the quarry and clay borrow areas and retained for landscaping of the recreational areas;
- commencement of revegetation/assisted natural regeneration within the construction site in areas that will not be inundated with local native species as soon as possible after disturbance;
- revegetation of embankment treatments along the Nerang-Murwillumbah Road with local native species, including *Allocasuarina* as soon as possible after disturbance;
- use of existing roads and disturbed areas with non-remnant vegetation for haul routes, storage/stockpile areas, workshops, crib huts and site office wherever practicable;
- trees of merchantable size and value are to be salvaged and logged in preference to wasting this timber resource. Arrangements with the Department of Primary Industries (DPI) will be made in relation to the logging of salvageable timber;
- preparation of a weed management plan prior to any construction or clearing activities occurring to prevent the spread of declared weeds (see **Section 9.6.4** for details).

Significant Flora

No EPBC listed flora or fauna species have been recorded in the area immediately surrounding the dam wall, clay borrow or saddle dam. The construction phase of the Project is considered likely to have minimal impact on populations of significant flora, which are predominantly located away from proposed infrastructure and in areas which will be subject to inundation.

Nevertheless, there are several actions which will be completed concurrently with or prior to construction works, including the following:

- identification of potential translocation sites for significant flora. A number of criteria should be considered during the investigation i.e. land ownership, accessibility, suitability of abiotic characteristics (e.g. soils), vegetation and current (or likely) historical occurrence of populations of the target species;
- development of Translocation Plans (and associated management plans for translocation sites) for Spiny Gardenia, Onion Cedar, *Plectranthus nitidus* and Rough-shelled Bush Nut. It is intended that suitable translocation sites be identified within the study area (above the proposed FSL), and that propagated individuals of the target species be planted at several sites. These sites will then be subject to active management to reduce threatening processes such as weed invasion and fire in particular. Further detail is provided in the report on matters of national environmental significance, Appendix C;
- propagation trials for significant flora known from the study area and establishment of ex-situ populations of those species. Pilot propagation and planting trials should be initiated as soon as practicable to determine the translocation potential of the target species; and
- environmental awareness training of employees to include targeted training in relation to identification of certain threatened flora and fauna species.

Fauna Management

The NCA and the Nature Conservation (Wildlife) Regulation 1996 require that protected animals whose habitat has been or is about to be destroyed by human activities or natural disasters are cared for and rehabilitated. Compliance with these Acts will be required. These matters are comprehensively addressed in the Fauna Management Environmental Management Plan.

9.6.3 Operational Phase

Flora

There are a range of flora management actions which will either be carried out concurrently with construction works or continue into the operation phase of the Project, these include the following:

- a compensatory habitat strategy incorporating vegetation offsets will be developed for the Project. The strategy will provide, as a minimum, one for one “replacement” of the remnant vegetation and essential habitat lost. Details of the compensatory habitat strategy are provided in **Section 9.6.5**.
- retained populations of significant flora species will be monitored to assess the impact of the dam on these species over time. The following factors will be considered at six (6) monthly intervals, and recorded in a database:
 - number and proportion of retained plants surviving;
 - general health of plants;
 - estimates of biomass;
 - number of retained plants producing flowers;
 - number of plants developing fruit;
 - natural establishment of seedlings within areas adjacent the known populations of significant flora;
 - survival of natural recruits to maturity;
 - production of flowers and fruit in the second generation; and
 - production of viable seed in the second generation.

If greater than 10% of the retained plants die within three (3) years of the development, then an investigation will be conducted and a report provided to the appropriate authority outlining reasons for increased mortality and appropriate management actions.

- translocation strategies will be finalised, following on from trials to be completed during the construction phase of the Project. Monitoring and management of translocation sites will be ongoing until such a time as the translocated plants demonstrate reproductive success and the populations are considered self-sustaining.

Fauna

Few ongoing impacts on terrestrial fauna have been identified as a result of this Project, and it is expected that there will be minimal fauna management required during the operation phase. Vertebrate pest management (which is currently carried out by GCCC Rangers) will continue indefinitely.

There are several long-term actions which could promote the recovery of significant fauna species across the study area, including the following:

- propagation and planting of the larval food source plants of *Phyllodes imperialis* and the Richmond Birdwing Butterfly, *Carronia multisepeala* and *Pararistolochia praevenosa* respectively. These plants could be incorporated into rainforest rehabilitation programs; and
- monitoring of populations of the vulnerable Tusked Frog and Endangered Giant Barred Frog to assess long term population trends and disturbance responses. The Tusked Frog occurs around the existing shoreline of Advancetown Lake, whilst the Giant Barred Frog is restricted to the Nerang River and tributaries in the Numinbah Valley.

9.6.4 Weed Management Plan

A Weed Management Plan will be prepared for the Project in accordance with the EMP. Management measures to prevent the movement of declared weeds to and from the construction site include:

- use of wash-down facilities for vehicles and equipment entering and leaving the dam construction site and those areas proposed for vegetation clearance;
- all machinery, equipment and vehicles shall be certified as “clean” prior to entering the site by trained personnel in accordance with DNRW practices;
- weeds are not to be used as mulch for landscaping, disposed of to Council’s landfill and burnt to prevent reseeding;
- soil, earth and landscaping material brought onto the site must be from a source that is clean and weed free;
- the monitoring of re-vegetated areas to identify new infestations and eradicate any declared weeds found; and
- weed monitoring to ensure that new weed species are not introduced into the immediate area of the dam catchment.

9.6.5 Compensatory Habitat Strategy

Background

A compensatory habitat strategy is to be developed for the Project. The objectives of the strategy will be twofold; (a) the strategy will aim to provide tangible conservation and biodiversity benefits at the local and citywide scale, with an emphasis on threatened species conservation the strategy and (b) will seek to comply with the intents of the Queensland *Vegetation Management Act (1999)* and associated Codes and Policies.

The compensatory habitat strategy is likely to involve a combination of the following options:

- securing advanced regrowth (near remnant) vegetation within and outside Gold Coast City which is representative of the RE’s and essential habitat to be cleared for the Project. The properties will be either purchased by GCCC or secured via registered covenant. In both cases the properties would be actively managed until such time as they reach remnant status;

- securing RE’s of equivalent conservation status to those to be cleared for the Project within and outside Gold Coast City and managing these areas until such time as they meet remnant status;
- strategic purchase of key land parcels which have been identified as key linkages or habitats for EVR taxa at the local, sub-regional or regional scale; and
- revegetation and rehabilitation of existing cleared areas of land within the study area, with a view to re-instating pre-clearing vegetation types.

Offset Targets

The Offset Policy sets targets for the condition, area, configuration and status of vegetation offsets, and the Compensatory Habitat Strategy will work towards meeting these targets. The proposed targets for the compensatory habitat strategy are outlined in **Table 9-26**.

■ **Table 9-26 Offset/Compensatory Habitat Targets**

Attribute to be Offset	Area Lost (ha)	Minimum Offset ratio	Minimum Offset Area (ha)	Additional Requirements
'Of Concern' regional ecosystem 12.3.2	13.17	1:1.5	19.75	<ul style="list-style-type: none"> ■ The proposed offset would ideally be the same regional ecosystem as the area proposed for clearing; ■ The proposed offset would ideally be within 20 kilometres of the area proposed for clearing; ■ The site must be non-remnant vegetation, or remnant vegetation that is otherwise committed to development; ■ The proposed offset site should have weed cover; ■ The proposed offset site should demonstrate the capacity to reach remnant status (with management), attain remnant status within a reasonable timeframe; and; ■ Ideally, the proposed offset site would require minimal revegetation.
'Of Concern' regional ecosystem 12.3.11	7.89	1:1.5	11.83	As above
Threshold regional ecosystem 12.11.	1.5	1:2	3	As above
Essential Habitat	240	1:1.5	360	<ul style="list-style-type: none"> ■ Proposed offset site must include all of the essential habitat factors—including any mandatory habitat factors—as the area of essential habitat proposed for clearing; ■ Proposed offset site be the same regional ecosystem as the area proposed for clearing; and ■ The offset must demonstrate that the impacts on the species are mitigated by the offset.
vegetation associated with any watercourse	43.26	1:2	86.52	<ul style="list-style-type: none"> ■ Proposed offset site must be a regional ecosystem associated with any watercourse that has the same or higher conservation status than the regional ecosystem proposed for clearing; and ■ Proposed offset must be a regional ecosystem associated with a watercourse that has at least the same stream order as the watercourse proposed for clearing.
TOTAL			481.1	