3.12 Visual And Landscape Assessment

3.12.1 Visual amenity

This road has been designed to be in harmony with, rather than imposing itself upon, the landscape. The road traveller's experience is reflective of that design, and in contrast with the straighter and/or more open sections of the Pacific Highway immediately to the north and south.

The bridges over the Brunswick River are balanced cantilever bridges. This design was partly chosen because of the need to cross the river at a slight angle, and maintain the open visual landscape. It incorporates design features and lighting to enhance its visual amenity.

A clear noise barrier was constructed near Rajah Road at Ocean Shores to maintain views to the south-west across the river to the mountains for residents. It also reduces the visual impact of the bridge from more distant locations compared with the use of an opaque barrier.

Maintaining sightlines from the highway at key locations was also addressed during the design phase, through maintaining connection with the changing landscape.

As a consequence the design has utilised many measures to minimise the impacts to local residents and businesses, and to road users.

3.12.2 Landscape Plan

To minimise the visual impacts from the project as well as expand the driver experience associated with the Upgrade, a Landscape Plan was developed through consultation with both regulatory agencies and the local and wider community. The landscape design was issued as 100% stage development in July/August 2006.

For most of the route the aim of the landscape treatment was to integrate the road into the surrounding landscape by matching species used on the corridor with the adjacent flora. This was achieved using indigenous native flora, mostly from local seed stock, some used as seed in the hydro-mulch mix and others propagated in local nurseries, and planted as tubestock. Given the early stages of the planting, it is considered that the planting will soften the road footprint, however the final impact will be dependent upon controlling the growth of some of the more aggressive grass species, and the dominance of wattles in some sections. Some plants are showing signs of yellowing and slow growth, and it is considered that better results could have been achieved with more thorough soil testing and amelioration.

More formal planting was undertaken to define the entrance to Billinudgel. As one would expect, this planting may take several years to reach significant height, and thus create the desired impact.

3.12.3 Propagation

General
A local native seed collection exercise was conducted in 2005. As a result of a review of local native nurseries, Mullum Creek Native Nursery at Mullumbimby was selected to propagate

collected seed stock on behalf of the project. Propagation commenced in January 2006, with subsequent incorporation into the project.

Photograph 3.36 Inspecting plants grown from local seed-stock and destined for use in the final landscaping of the Upgrade.

Marblewood (Acacia bakeri)
Following approval for a translocation program from DECC (NPWS), three local nurseries were also selected to receive cuttings of the threatened species *Acacia bakeri*. Some of the Burny Bean seed collected earlier by the project ecologist was also successfully propagated, and following consultation with DECC / NPWS were subsequently replanted on the Upgrade. Several techniques were assessed however all showed that *Acacia bakeri* had little prospect of transplanting successfully.

In January and February 2005, seeding trees of *Acacia bakeri* were common in and around Brunswick Heads Nature Reserve, but for the last two years no flowering or seeding was observed, indicating that reproduction in *Acacia bakeri* is intermittent. It was one of several threatened species with low or nil seed production during the last two years.

It is also worth noting that although seeding was common in 2005, no flowering or seed production was observed at this time in trees at the STP Road. This appears to indicate that the STP road stand of *Acacia bakeri* was in poor condition, possibly due to dense vegetation structure at this site, below average rainfall and competition for scarce resources.

In 2005/2006, 62 seed-propagated individuals propagated from eight parent trees and three cutting propagated plants were planted out. The survival rate was 42% after 12 months and growth was very slow. A further 17 more advanced plants were introduced in 2006/2007 and planted into more open, sun-exposed micro-sites.

White Silky Oak (Grevillea hilliana)
A total of four individuals were transplanted. The survival rate remains at 25% (one out of four) after 36 months.

All transplants retained foliage for 2-3 months after transplanting. Three then shed foliage but failed to re-shoot. The one surviving individual has regrown vigorously.

White Yiel Yiel (Grevillea hilliana)
Only small quantities of seed were collected from trees in Brunswick Heads Nature Reserve and a location on Coolamon Scenic Drive in summer 2004/2005. Seedlings were successfully propagated from two parent trees and were planted at both sites. In addition, a single cutting was successfully propagated from cutting material collected during transplanting and was planted out in Site 1. This is a clone of the one surviving transplanted individual (four other transplants died).

In total, nine enhancement individuals were propagated and planted out. These have survived well and are currently (2008) 2m or more in height

3.12.4 Final Planting

Initial stabilisation was performed with quick-growing, but short-lived, sterile, exotic species. Final plant selection was a combination of native seed incorporated into the hydro-seed mix, tube-stock and some advanced plants in key areas such as Billinudgel, in front of the Retaining Wall At Ocean Shores, and at roundabouts.

A combination of steep slopes and major rainfall events meant that some areas had to be re-topsoiled and seeded several times. This result partly resulted about from an assessment of risk and cost which did not match the conditions (soil, slope, and rainfall). The Yelgun Rest Area, in particular, proved to be challenging, but has now been effectively stabilised. The practice of using low mulch application rates on steep slopes is not cost-effective in the long-term.

Following some poor plant performance, a soil analysis was commissioned and a report submitted by Abigroup's designers to the RTA and the project verifier. The report indicated that the existing soils in the surrounding landscape were acidic (pH 4.9 to 5.8) and lime treatment of soils on the batters was incorporated into the hydro-seeding program. This significantly improved the plant vigour in a number of locations.

Planting was not completed prior to the opening of the Upgrade, and further tube-stock and hydro-mulching/hydro-seeding occurred in 2008.

Photograph 3.37 Two different revegetation strategies are evident here. The trees in the foreground were planted into a grassed bank, whilst those in the background have grown from seed. It is hoped that the pioneer species in the background will eventually be replaced by other species in the seed mix. The planting in the foreground will need to be actively managed for some years until the trees grow large enough to out-compete the grasses.

In some areas the pasture grasses used in the northern section of the project have been out-competing the tube-stock and mowing and slashing has been, and will continue to be, required to reduce this competition until the plants are large enough to shade-out these grasses. There is a significant cost implication associated with the decision to use these grasses. They may have lowered construction costs, but have significantly increased maintenance costs. It is considered likely that the overall cost is higher than if a more suitable erosion control product had been utilised with a higher mulch component on the steeper slopes.

The practice of planting tube stock into areas where grasses are already established and growing well requires more effort (greater cost) to minimise competition from the grasses. This includes soil preparation (herbicides, ameliorants and fertilisers), the use of weed-mat, and follow-up spraying and mowing until the plants are well established. This wasn't performed during planting and the plants have suffered as a consequence.

Photograph 3.38 An example of how much effort is required to grow plants in areas dominated by established pasture grasses. This exceptional growth was achieved by active weed suppression using chemicals and physical means (mowing and slashing), soil amelioration, and slow-release fertiliser. These plants are four-month old tubestock. The higher establishment cost was off-set by the low mortality of 2%.

3.12.5 Operation

Maintenance during the operational stage is undertaken by BBS, in accordance with intervention levels stipulated in the Operational Environmental Management Plan (OEMP). This work is comprehensive and includes replacing plants which have died, stabilising areas where plant growth is not in accordance with the project requirements, controlling weeds and grass growth, removing roadkills, and maintaining water quality basins, and assessing general safety issues.

There are still some areas to be stabilised including a batter near the southern boundary of the project, and another north of the STP Access Road. These have been programmed for amelioration over the next year.

3.12.6 Learnings

Soil Testing

The landscape design needs to be undertaken with greater recognition of the soil characteristics, or more thorough amelioration to enable support of the proposed planting. This includes both topsoil and subsoils to the anticipated rooting depth. The soil-testing regime

needs to be undertaken of topsoil and subsoils to understand not just the landscaping issues, but also erosion and sediment control, and engineering constraints. The minimum suite should include:

- pH;
- electrical conductivity, chloride (EC, Cl);
- Organic carbon, total nitrogen / nitrate nitrogen, sulphur (C, N, S);
- Exchangeable basic cations (Ca, Mg, K, Na);
- Exchangeable acidic cations (H, Al);
- Cation exchange capacity (CEC);
- Plant-available phosphorus and potassium (P, K);
- Micronutrients (Fe, Mn, Cu, Zn, B);
- Particle-size analysis / field texture description.

This can, and should be performed during the planning phase, with interpretation by a suitably qualified soil scientist.

Queensland Main Roads has developed an excellent series of publications with regard to soil and landscaping issues, and standards to guide such assessment.

Steep slopes
A risk assessment needs to be performed on projects recognising slope steepness and slope length, ground cover, and erosion practices. Suitable responses are then needed to meet those risks. These include, but are not limited to, controlled clearing, early installation of drainage, and temporary and/or permanent stabilisation, including mechanical stabilisation. The contractual requirements need to ensure that long and/or steep (≥ 2:1) slopes are treated so that the risk of erosion is minimised until final stablisation is achieved. These include, but are not limited to mechanical stabilisation, bonded fibre matrices, compost blankets, and irrigation of fast-growing, densely seeded cover crops. The issue goes beyond that of the economics associated with repairs, but to the environmental cost, something less easily quantified.

Higher mulch rates are required for steep slopes. For example, bonded fibre matrices with non-rewettable binders should be applied at rates of 5–6 tonnes/hectare. These provide complete protection to the ground against raindrop impact, better retention of the mulch on the slope, and higher moisture retention. With higher weed suppression they also allow more control over weeds and reduced competition for tubestock.

Pasture grasses
The use of pasture grasses as part of any rehabilitation needs to be assessed from many perspectives, including whether they will compete with native grasses and or plants proposed for the final landscaping. The potential to spread into adjacent areas also requires assessment. It may be cheaper to use high rates of sterile cover crops to provide short-term stabilisation prior to establishment by the generally slower growing native grasses. Mechanical or chemical control may also be utilised as part of this programme.