2017

Award for Environmental Excellence
- Aura -

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Section 1

1.1 Marketing statement

Aura is the first urban development of this scale and size in Australia. The development is changing the views of the industry by demonstrating that urban development can occur with minimal impacts to sensitive catchments. Unique features about the Aura development are the industry leading management and control of stormwater runoff, and the management of the federally listed Wallum Sedgefrog.

The project team has implemented innovative erosion and sediment control (ESC) strategies, which have achieved industry leading protection of our waterways and catchments. Through research, collaboration and innovation, the Aura project team delivers outstanding environmental results, significantly beyond current industry standards. For example, to manage stormwater runoff, the site has adopted the use of high efficiency sediment (HES) basins. The use of HES basins at Aura has revolutionised stormwater management within the construction industry. By using HES basins, 300 tonnes of sediment was prevented from entering the Pumicestone Passage during high rainfall in March 2017 alone.

There have been several other challenges to overcome including adaptive design of HES systems, WSF management, and stabilisation within sub-catchments. An adaptive management approach has provided insights that have resulted in continued improvement in environmental management.

Section 2

2.1 Summary

Aura is a master planned community on 2,400 ha located 2 km south-west of Caloundra on the Sunshine Coast. Shadforths Civil Contractors (Shadforths) are Principal Contractor at Aura, and Stockland are the developer. The nature of this development is on a mega scale, and on a timeframe that is estimated to be thirty years before it is completed in its entirety. The site is traversed by three waterways, which flow into Pumicestone Passage, part of the Moreton Bay Ramsar site. The local, and regional environments surrounding Aura contains listed threatened species, habitats, and listed migratory species. To ensure the protection of these critical species and environments, Shadforths and Stockland developed and implemented an approach that goes beyond best practice.

Unique features about the Aura development are the industry leading management and control of stormwater runoff through innovative erosion and sediment control methods, and the management of the Wallum Sedgefrog *(Litoria olongburensis)* (WSF).

To manage stormwater runoff, the site has adopted the use of HES basins. The use of HES basins at Aura has revolutionised stormwater management within the construction industry. By using HES basins at Aura, incredible volumes of stormwater runoff has been treated to a standard that is far superior compared to what could have been achieved if standard industry best practice management techniques were used. As detailed in this submission, HES basins have the capability to treat and release high volumes of stormwater automatically. The HES basin system incorporates automated dosing to allow runoff from construction areas to be treated as it passes through a sediment basin prior to release. Using this revolutionary industry technology, HES basins allow a

significant increase in the performance of stormwater treatment during consecutive and large rainfall events.

Figure 2.1.1 - HES Basin H3 displaying water quality and incorporating water sensitive urban design principles

The project has also adopted a strategy to oversize the HES basins to provide greater environmental risk mitigation, and an adaptive management approach. This allows runoff to be managed appropriately with other environmental constraints such as the protection of the WSF that is listed as vulnerable under the *Environmental Protection and Biodiversity and Conservation Act 1999* (EPBC Act). Protection of the WSF required careful planning. This includes the conservation of existing significant habitats to be retained within the waterway corridors, the creation of additional WSF habitat, and enhancement of existing WSF habitat along the waterway corridors (ARUP 2015).

Section 3

3.1 Location

Aura is a master planned community on 2,400 ha located 2 km south-west of Caloundra on the Sunshine Coast. Shadforths Civil Contractors (Shadforths) are Principal Contractor at Aura, and Stockland are the developer. The Aura project site was once operated as a pine plantation. However, it is now largely cleared and used for cattle grazing.

3.2 Milestones

The commencement of construction of Aura began in Precinct 1 at the beginning of 2015. Contracts are issued in a staged manner as the project progresses and there have been numerous completed contracts since commencement. A major milestone occurred in October 2016, when construction was finalised on the Lamerough Creek Bridge, which crosses Lamerough Creek and signified the opening of Aura. The Lamerough Creek Bridge spans 75m and includes fauna crossings, a frog underpass, rope crossings for native marsupials, and a landscaped verge for other animal

movements. The completion of each HES basin at Aura has been a milestone, as this ensures each catchment can drain to an automated stormwater treatment system.

3.3 Interface with other major parties:

Through the successful delivery of numerous contracts at Aura, Shadforths are developing sustainable working relationships with a number of other parties. CV Services, Unity Water, Sunshine Coast Council, and Eureka Landscapes, are the main subcontractor parties involved in the project. At the required phase of the project, these contractors are employed by the client to execute projects outside the scope of Shadforths works, such as electrical work, and landscaping. Other project parties such as the superintendent (Cardno, Calibre and SMEC) consult between designers, contractors and the client. All communication regarding construction matters goes through the Superintendent.

Other smaller subcontractors are involved at various stages of works. For example, Turbid are engaged to manage the HES basins to ensure telemetry is maintained and operational, and that the flocculent supplies are always available. Topo are the ESC experts, and in conjunction with the project managers, Topo prepare the ESC plans for each contract. Australian Wetland Consultants are responsible for the management of created frog habitat, which is also implemented in conjunction with the project team.

As the principal contractor, Shadforths ensure that other contractors are safe to perform their works on site and the interface between the bulk earthworks, civil works, and other work fronts are appropriately managed. Two main methods exist at Aura for the formal communication and documenting of information regarding the different work fronts. Weekly compliance meeting and the fortnightly construction meeting.

1. Shadforths weekly site compliance meetings are held every Monday morning at 8am. Shadforths project team, civil foreman, bulk earthworks foreman, CV Services and Eureka Landscapes attend this meeting. The meeting involves the discussion of any issues, and the proposed sequence and program of works for the week ahead for each party.

2. Shadforths fortnightly construction meeting that is facilitated by the Superintendent is the formal. The meeting is minuted, and the minutes distributed prior to the following meeting.

Section 4

4.1 Distinctive Features and Challenges

Due to the sensitive nature of the receiving environment, approval conditions imposed stringent water quality, and stormwater capture (77mm / 5 day) criteria upon the project. As a result, advanced industry technology for ESC methods have been utilised. This includes a combination of initiatives, such as the use of HES basins. HES basins are an extremely effective stormwater treatment device. The Aura site has an unprecedented 6 operational HES basins, one HES basin converted to a wetland, one HES basin under construction, and one decommissioned HES basin. A selection of these HES basins are illustrated in Figures 4.1.3 to 4.1.6.

At Aura, site runoff water is directed to a HES basin inlet where it is measured for quality, and volume by an automated dosing system (ifod) (refer to Figure 4.1.1 below). Water is then

automatically treated with the correct amount of coagulant at the basin inflow (refer to Figure 4.1.1 below). The site uses Turbiclear, which is a high quality, environmentally friendly coagulant designed specifically for use in HES basins. Depending on the pH of runoff water, lime is also automatically added at this point. The water, lime and coagulant are mixed in the first cell called a “fore bay”. The water then flows slowly and evenly into the main larger sediment basin, allowing the flocked fine sediment to drop out of suspension. Clean water is then discharged at the far end of the basin through a stabilised spillway or an automatic decant pipe.

Figure 4.1.1 - Runoff entering HES basin (H6 left and H3 right) through concrete inlet. Monitoring equipment records inflow water quality data, and an automated dosing system provides treatment.

This system allows for the reliable treatment of stormwater runoff during large and consecutive rainfall events. Advanced telemetered monitoring is attached to each basin at inflow and outflow points. Data is recorded for a vast range of parameters and can display real-time, and historic readings, as well as sending SMS alerts as required. HES basins at Aura have evolved from linear structures, to structures that fit into the landscape and become permanent water sensitive urban design (WSUD) features. They are also oversized for higher rainfall capture during events. A small volume of water remains in the basin post dewatering (usually around 30% of basin capacity), allowing for reuse on site. Detailed pre and post rain event inspections, daily monitoring and reporting, and ESC training for workers has been implemented and culminates in a culture that strives for beyond best practice.

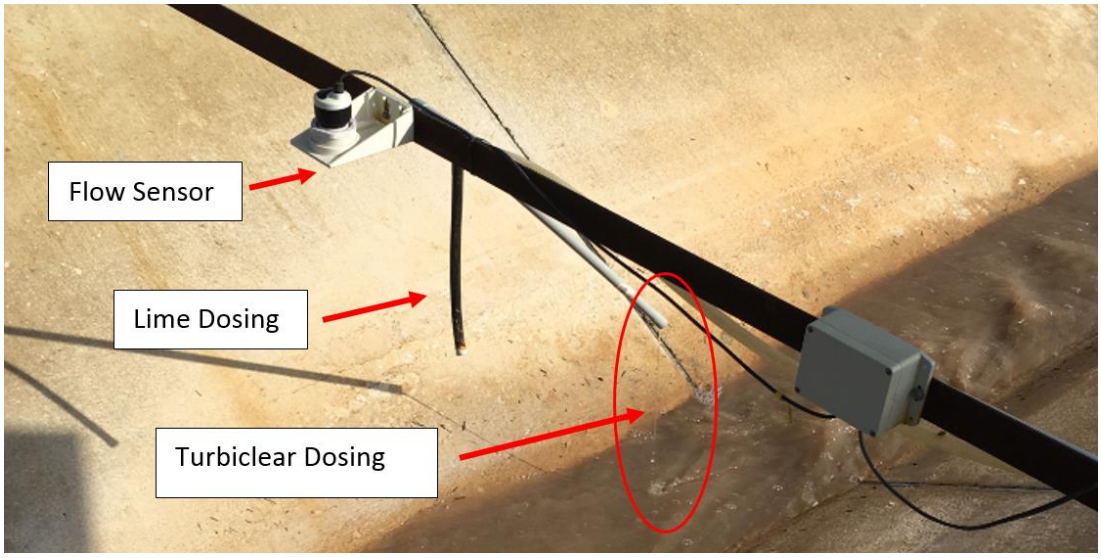

Figure 4.1.2 - Automated dosing occurring at inflow of H2 HES Basin.

In comparison, traditional batch basins, which are commonly used on construction sites and considered best practice will capture and store water for treatment and dewatering post rainfall event. They rely upon manual treatment and require manual discharge by pumping. If the basin has not been emptied in the required timeframe or there is an additional rainfall event, runoff will discharge via a spillway, generally untreated.

Another challenge to overcome has been the strongly to extremely acidic local soils, which create runoff with low pH. In contrast, approval conditions require discharge from sediment basins to be at a near neutral pH, which is based on the background receiving environment studies in Lamerough and Bells Creek.
Soil amelioration

To manage this low pH runoff, several soil stabilisation and pH management techniques were trialled onsite over a twelve month period. With a long term approach in mind, trial plots were established onsite each with a different stabilisation method. The result was the adoption of a catchment, and point source management approach. The catchment management approach was to raise the pH of site runoff by ensuring that all finished lots are topsoiled, treated with lime (to raise pH), drill seeded, and hydro mulched for complete stabilisation. This has culminated in method that promotes rapid grass growth and a topsoil with near neutral pH. Any remaining pH issues are dealt with by point source management, which refers to treatment at the inlet to HES basins. Each HES basin has automated lime dosing system to manage pH on inflow (refer to Figure 4.1.2 above).

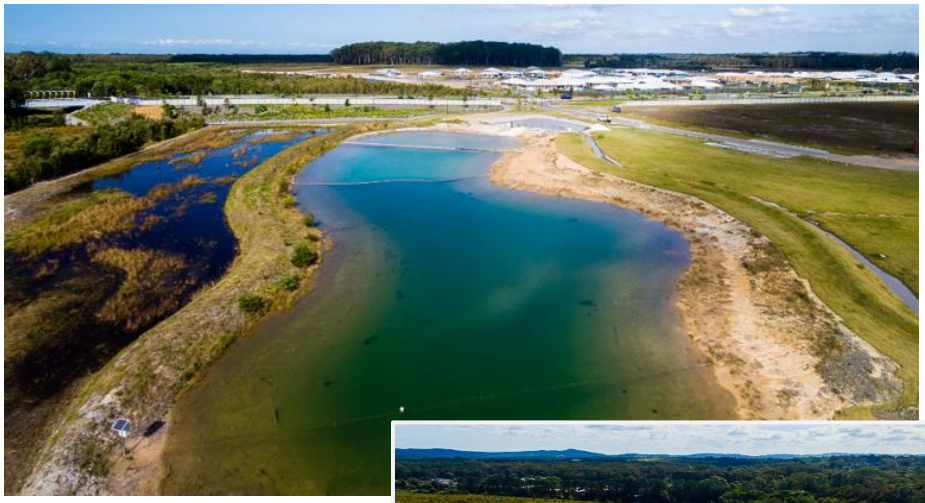

Figure 4.1.3 (left) - Aerial photo showing H2 HES basin water quality

Figure 4.1.4 (right) - Aerial photo showing H3 HES basin water quality

Figure 4.1.5 (left) - Aerial photo showing H5 HES basin water quality in background, and converted H4 HES to a wetland bio-retention system in foreground

Figure 4.1.6 (right) - HES basin H7. Large volume interim (not permanent)

4.2 March 2017 Rainfall Event

Through implementation of these initiatives, the program has achieved outstanding environmental outcomes resulting in significantly improved protection to the Pumicestone Passage and tributaries. For example, in March 2017 alone, 511mm of rain was experienced on site. This is the largest event in the sites history. Based on the performance of the sites HES basins operating at the time, approximately 300 tonnes of sediment was prevented from being released from site compared to standard industry practices. This quantity was calculated using the HES basin monitoring data received at inflow, comparing the results of turbidity actual turbidity levels discharged, against that permissible using standard traditional basins assuming minimum recommended requirements had been met. The outstanding results are consistent and similar for every main rain event in 2016 and 2017.

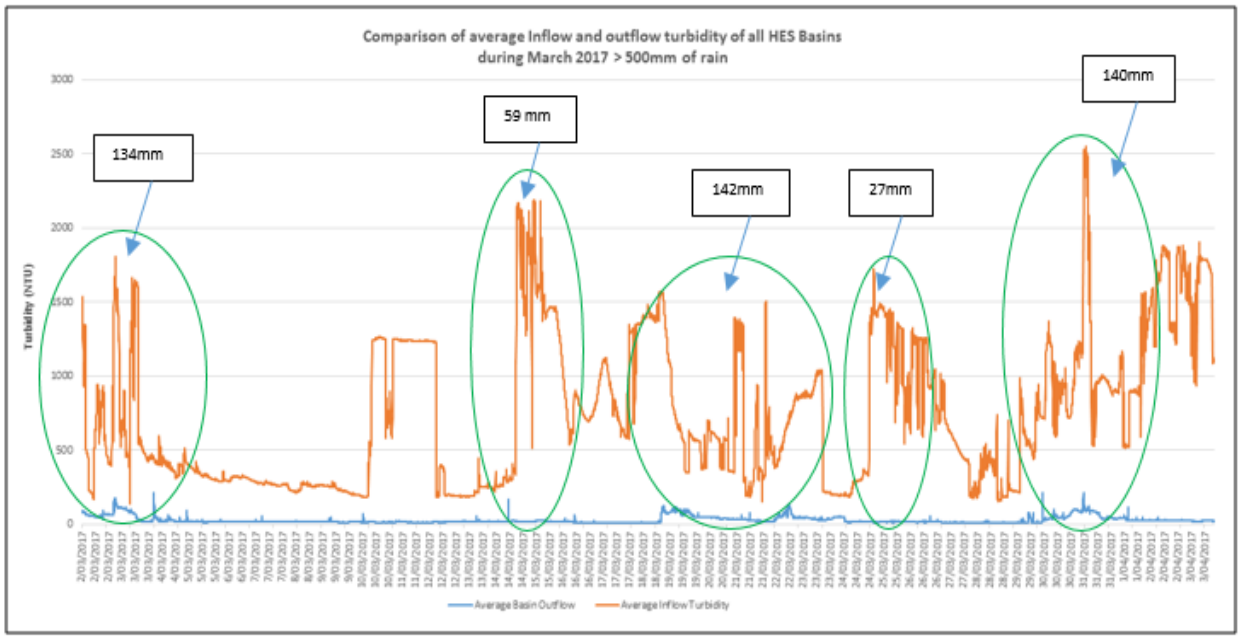

Figure 4.2.1 - HES basin inflow versus outflow turbidity through month of March 2017 (511mm of rainfall). Based on lab analysis of water samples and an associated site specific correlation report by O2 Environmental, 50mg / L is equivalent to 100NTU.

A traditional sediment basin with typical 45mm rain event capture would have frequently overtopped during this month. Discharge turbidity would have been at levels near that shown by the orange inflow data in Figure 4.2.1 - during the events and manual treatment would have been required. Treatment would have been difficult due to the saturation levels of the site and the large volumes of ongoing runoff. With many large and consecutive events treatment and compliant release of stormwater would have been very difficult, and at times impossible resulting in very poor environmental outcomes.

Installation of the oversized HES basins, implementing automated dosing and adopting a flow-through approach, the total suspended solids of the runoff discharged during the rainfall event into the creek systems was below 50mg/L.

4.3 Wallum Sedgefrog Management

The WSF is a small, arboreal frog that is found in wallum habitats onsite. These habitats are characterised by acidic conditions and ephemeral wetlands. It is also known as one of the acid frogs due to its preference and tolerance for acidic ground and water conditions. The WSFMP details the mitigation strategy for the overall protection and management of the Wallum Sedgefrog. The mitigation objective is to deliver an outcome that maintains or improves functioning populations of Wallum Sedgefrog with connectivity between populations.

Site water quality release criteria does not permit discharge to WSF habitat. The HES basins are designed to allow stormwater discharge to bypass frog habitat, via turf lined swale drains. These swale drains direct water straight to local creek systems.

Created Wallum Sedgefrog breeding habitat is being constructed progressively throughout the project. In precinct 2, a total of twenty breeding ponds have been constructed along the southern bank of Lamerough Creek. These ponds form part of an overall area of Sixteen hectares of habitat recreated for the Wallum Sedgefrog. Nine hectares of existing Wallum Sedgefrog habitat have been protected and preserved, adjacent to Precinct 2. Based on the current mapping and plan of operations a series of connected habitats will create a net gain of 60 hectares in WSF habitat.

Figure 4.3.1 - Wallum Sedgefrog habitat with viewing platform and information board

To help facilitate the success of created WSF habitat, Shadforths have designed an excavator attachment called a slabbing bucket. The attachment is designed to remove slabs of premium habitat 250mm thick x 1500mm wide, out of the construction zone. Premium habitat and topsoil (live topsoil) is removed by the bucket and translocated to the created WSF frog areas. This provides instant habitat outside of the work zone and to be conserved in perpetuity. The benefit is that any WSF's that are found onsite can immediately be relocated to created WSF habitat. Without this slabbing method, habitat areas take months to establish the right conditions after construction, and years for frogs to migrate into them. Populating this translocated habitat with relocated individuals, greatly improves the probability of success of created WSF habitats.

Figure 4.3.2 - Slabbing bucket

Section 5

5.1 Quantifiable benefits

5.1.1 Environment

The Aura project has implemented 'better than best practice' measures to ensure protection of our natural assets including water quality, flora, and fauna. Aura has raised the bar, setting new industry standards in research led design, construction management and stakeholder engagement. To date, Aura has achieved outcomes that far surpass what would be achieved if current industry best management practices had been adopted. The Aura team will continue to prioritise the protection of the environment and lead the industry through innovation and partnering.

Aura has developed site specific ESC procedures to manage soil, sediment and water quality. As previously mentioned in section 4, finalised lots are stabilised with topsoil, treated with lime, drill seeded, and then hydro-mulched, with all drainage across site directed towards a HES basin for treatment. This procedure has been successful in retaining topsoil onsite and greatly reducing, and in some cases eliminating sediment release offsite. The data gathered from HES basin monitoring systems provides excellent quality data, which can be used to quantify the benefits of this ESC methodology. Enormous volumes of sediment have been retained onsite rather than entering local creek systems. As discussed in section 4, in one month alone, March 2017 a calculated volume of 300 tonnes of sediment was retained onsite, compared to what could have been retained if traditional batch basins were used.

Landscape vegetation is an integral part of the development. Native vegetation is planted specifically based on its location within the site. To date approximately 700,000 individual natives have been planted on the site. This includes: 296,400 shrubs, 392,000 grasses, 1600 mature trees, 10,000 wetland plants

5.1.2 Community

Aura's innovative environmental program has been conducted collaboratively with the broader community. HES basins are frequently included as part of key community and stakeholder site tours to convey key learnings. This has included onsite inspections by stakeholders such as the Aura Community Stewardship Group, which is represented by over 18 local community and industry

groups. Key areas of interest have been how the innovative ESC practices are working, how the design and management practices have been adapted and how they are performing to ensure maximum protection of the Pumicestone Passage and waterways from construction activities. In addition, Shadforths hosted a site visit from Healthy Land and Waterways, which included eighty professionals from the erosion and sediment control industry. This site visit was an information session to educate the ESC industry on the effectiveness of the HES basins. The visit included a visit to an onsite basin that was actively receiving water.

The result of such open and transparent site demonstrations within the construction areas has assisted to build social confidence in the innovative ESC approaches being adopted. The result through the enhanced social license is the strengthening of the culture with the design and development teams to continually innovate, wanting to achieve the best possible outcomes for the environment. The success of the HES basins at Aura has combined with the other key learnings and are now achieving broader industry and community interest with far reaching benefits, from changing community perceptions of the development industry and its management of ESC.

5.1.3 Shadforths

In achieving the demands of accelerated programmes at Aura, whilst staying within the allocated budget, Shadforths have developed and maintained a strong professional relationship with the client, Stockland. The statement from Stockland, which is shown below demonstrates the level of satisfaction felt by the client at Aura.

Stockland

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To whom it may concern,

The Aura development adopted innovative world leading approaches to managing impacts of civil construction, which is above industry best practice, designed to protect the natural environment. Shadforths have been crucial in developing this management approach, which has achieved exceptional outcomes that exceed industry standards.

There have been several challenges to overcome, however the level of professionalism, proactive approach and attention to detail ensured works were delivered to the satisfaction of all stakeholders including community organisations, authorities and Stockland.

Shadforths collaborated with the wider industry to demonstrate this innovation, further supporting Stockland's brand and demonstrating themselves as a preeminent civil contractor.

Regards

Josh Sondergeld
Senior Development Manager

Figure 5.1.3.1 - Client satisfaction letter