

## Case Study – Wetlands at Callide A Power Station

### Summary

In 1997, the Callide A power station planned to construct a wetland on its No.2. ash dam. Generally, the design was intended to provide aesthetic and environmental enhancement of the area, retain the vast majority of runoff within the facility, and minimise leaching of trace elements from the ash. The design needed to ensure that runoff from the wetland would be of a suitable standard for discharging off-site. .

Research to determine the most appropriate design option for the wetland included: hydrological analysis, vegetation survey, soil typing and water quality analysis. A number of design options were considered before the final design was presented.

Presently, the wetland is operating as designed. It provides an attractive enhancement to the area and is frequented by local wildlife.

### Objectives for the wetland and its design

- provide aesthetic and environmental enhancement of the area,
- provide excess stormwater runoff buffering capacity,
- retain all runoff waters within the facility, but allowing minimal off-site discharges,
- vegetate the wetland area with species capable of "polishing" any contaminated runoff to a standard suitable for discharging off-site if required,
- consider financial constraints when establishing and maintaining the wetlands,
- provide a design that requires minimum ongoing maintenance.

### Wetland Design Options

Two designs were presented, each being a wetland planned as a single pond area. Each design was intended to capture and store as much runoff from the site as possible, and:

- maximise evaporation by maintaining a large surface area,
- provide a large, shallow water area that would frequently be wet so that it would support reeds and aquatic plants,
- provide a *Melaleuca* wetland area at the northwestern and (depending on the design adopted) eastern ends.

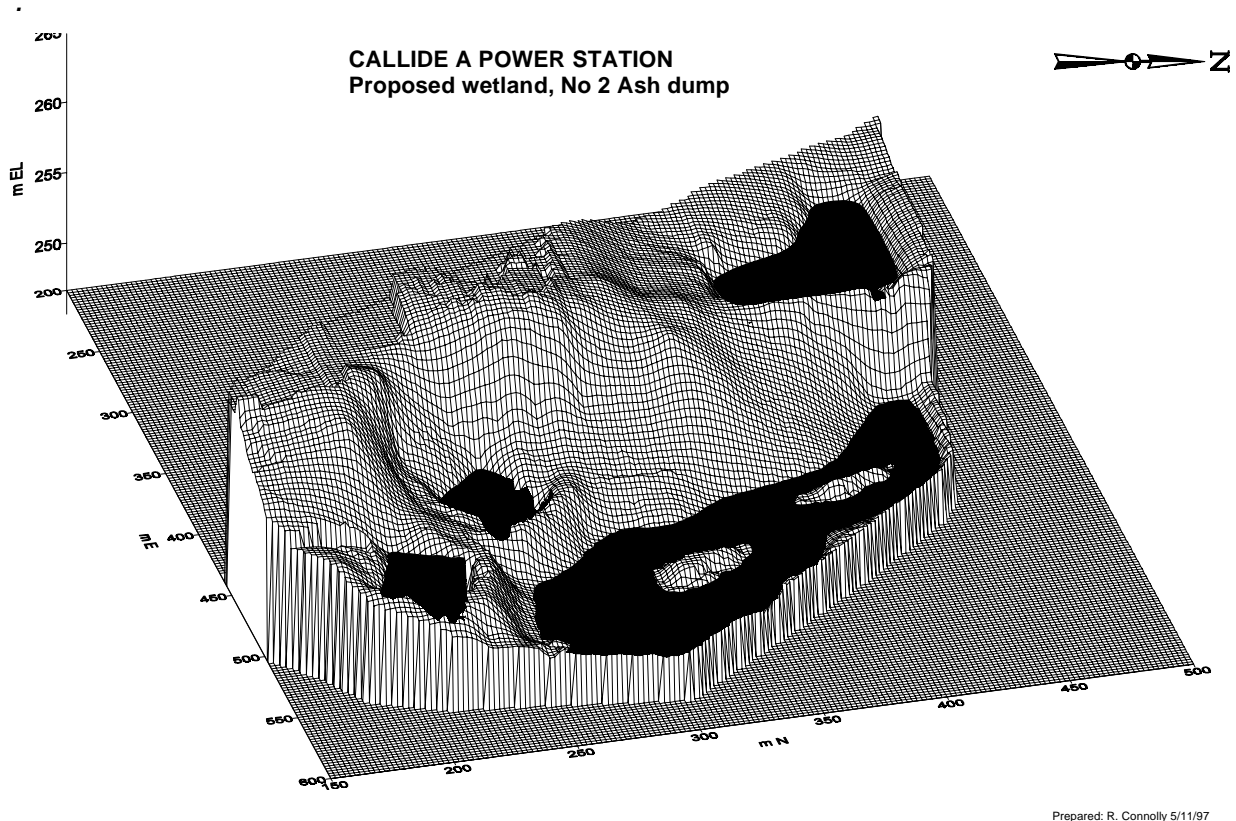
#### *Design One (including deep water area and wildlife refuge islands)*

This design included two islands surrounded by deep water to provide refuge for native animals and to improve the aesthetics of the wetland. This design assumed that the ash, when dry, would support the gradients necessary for the creation of deep-water areas and islands. Advice from AUSTA staff was that other ash deposits have been observed to have considerable structural strength, provided they are dry when worked.

Total ponded storage area in this design was calculated as about 28 ML; 19 ML in the wetland, 5 ML in the pond in the Coal Stockpile catchment, and 2 ML in the other two ponds.

Three scenarios for release of water from Design One were considered:

- a) controlled release via a riser, clay layer in place to minimise seepage to depth;
- b) no clay layer, controlled release as seepage through ash;
- c) no controlled release, clay layer in place to minimise water movement through under drain.



**Figure 1:** *Proposed Wetland Design One*

Scenarios (b) and (c) were rejected as design options. Scenario (b) would not retain enough water in the wetland for it to remain functional and scenario (c) would maintain too high a water level in the wetland pond, reducing its stormwater buffering capacity.

The controlled release scenario (a) assumed water was released from the wetland pond at a set rate until the water level reached a predetermined level. This scenario increased the stormwater buffering capacity of the wetland. It also allowed more control over water level depths in the shallow areas of the wetland pond, important for depth sensitive vegetation. Estimated average annual outflow from the spillway was 39% of inflows.

*Design Two (without deep water and islands for wildlife refuge)*

This design could be adopted if the structural strength of the ash was insufficient to allow formation of islands and deep-water areas as suggested in Design One. In developing this design, it was assumed that:

- A clay layer would be placed to reduce seepage losses;

- There would be no control of water depth via a riser.

This design had a water storage capacity of 6.7 ML, compared with 19 ML for the design with islands and deep water. One consequence of the lower storage capacity of this design was reduced stormwater buffering, with 68% of inflows to this design predicted to exit as overflow.

The final design presented was a modified version of Design One, with only one wildlife refuge island in place. Water release was via a riser, as described in water release option (a) above.

### **Vegetation**

A wide variety of local vegetation species was recommended along with a planting schedule. A listing of over 30 species was developed based on sampling of wetland plants in the area, with the recommendations aimed at producing sustainable ecological groupings on the wetland.

### **Results**

The final catchment design was aesthetically pleasing and hydrologically capable of supporting the vegetation required. From a hydrologic viewpoint, the wetland requires minimal maintenance.

The stormwater management ponds above the wetland, along with any excess capacity in the wetland pond, provide a stormwater buffering capacity. It was not possible to retain all runoff water from the facility in the wetland. However, calculations indicated that the final wetland design should, on average, capture between 39 and 60% of inflows to the pond. Outflows are only predicted to occur during storm flows when water quality is most likely very good.

At present, the wetland is functioning as designed and provides an extremely attractive enhancement to the natural area.





**Plates:** *Established Wetland on Callide A Power Station No. 2 Ash Dam.*