

Tweed Valley Hospital

# LANDSCAPE MANAGEMENT REPORT

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## CLIENT



## PROJECT NUMBER

1719

## PROJECT MANAGER



## LANDSCAPE ARCHITECT



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Note: All area calculations are advisory only and all figures should be checked and verified by a licensed surveyor.

## Contents

1.	INTRODUCTION.....	1
2.	METHODOLOGY.....	1
2.1.	Site inspection .....	1
2.2.	Preparation of report .....	1
2.3.	Coordination with other consultants .....	1
2.4.	Issue to Client .....	1
2.5.	Finalisation of Report.....	1
3.	LANDSCAPE ZONES & MANAGEMENT RECOMMENDATIONS.....	2
3.1.	Vegetation Buffers.....	3
3.1.1.	Roadway Edge Wind Break.....	3
3.1.2.	Internal Remaining Wind Break Environmental Zones.....	3
3.2.	Croplands.....	4
3.2.1.	Sown Crops.....	4
3.2.2.	Fallow Farm Lots.....	5
3.3.	North and Western Banks / Sediment Basins .....	6
3.4.	Orchards.....	8
3.5.	Moderate / High Value Trees.....	9
3.6.	Environmental Area Boundary .....	10
4.	SOIL MANAGEMENT .....	11
4.1.	Condition of Existing Topsoil.....	11
4.2.	Volume of Existing Topsoil .....	11
4.3.	Potential for Reuse .....	11
4.3.1.	Potential for reuse on-site .....	11
4.3.2.	Potential for reuse off-site.....	11
4.4.	Soil Management Recommendations.....	12

## 1. INTRODUCTION

Health Infrastructure NSW has recently taken possession of the Project Site for the new Tweed Valley Hospital, located at 771 Cudgen Road, Cudgen, NSW 2487 (28°15'48"S, 153°34'02"E) and described as Lot 11 in DP 1246853. The subject property lot covers an area of 19.38 Hectares (ha), with approximately 16 ha being used for agricultural production.

Turf Design Studio was engaged by Health Infrastructure NSW to assess the existing landscape condition, and provide recommendations for ongoing management of the landscape. A working group has been established to review the recommendations of this report.

## 2. METHODOLOGY

The following methodology was undertaken to prepare this report:

### 2.1. Site inspection

Scott Ibbotson conducted a site inspection to identify existing landscape zones and assess their condition

### 2.2. Preparation of report

A range of options for the management of each landscape zone were considered; varying in cost of implementation, aesthetic outcome, and ongoing maintenance requirements.

### 2.3. Coordination with other consultants

Recommendations for each landscape zone were issued to the consultant team for comment (architects, civil engineer, ecologist, fire, agricultural impacts specialist, etc.). Options further refined based on their inputs.

### 2.4. Issue to Client

Issue of report recommendations, including management options for some landscape zones.

### 2.5. Finalisation of Report

Incorporation of Client feedback to finalise the report, including final recommendations for management of each landscape zone.



### 3. LANDSCAPE ZONES & MANAGEMENT RECOMMENDATIONS

For the purpose of landscape management, the site can be considered in a number of distinct landscape zones, as illustrated in Figure 1 below:



### 3.1. Vegetation Buffers



#### 3.1.1. Roadway Edge Wind Break

A number of weed species are present within the understorey of the existing wind break along Cudgen Road. In order to minimise propagule spread into adjacent properties and environmental zones it is recommended that weed removal works be undertaken.

Weed species to be removed include:

- *Ochna serrulata*;
- *Asparagus fern*;
- *Cocos palm*;
- *Cinnamomum camphora*;
- *Olea Africana*;
- *Senna pendula* 'Glabrata';
- *Ligustrum sinense*.

All weed material is to be carefully removed to capture any seeds present. Resultant vegetative matter is to be removed from site and delivered to a waste management facility.

Annual weed management / removal is recommended to reduce future weed colonisation.

#### 3.1.2. Internal Remaining Wind Break Environmental Zones

Remaining windbreak zones across the centre of the site also contain substantial growth of weed species. Uncontrolled these zones will provide a source of weed spread across site. Their central location will provide maximum opportunity for weed seed dispersal. It is imperative that these zones have weed species removed prior to any surrounding works recommended herein. Once removed, Hydromulching as per 'Fallow Farm Lots' is recommended.

Works within the area cordoned off as an environmental zone are to be undertaken in consultation with the project ecologist.

### 3.2. Croplands

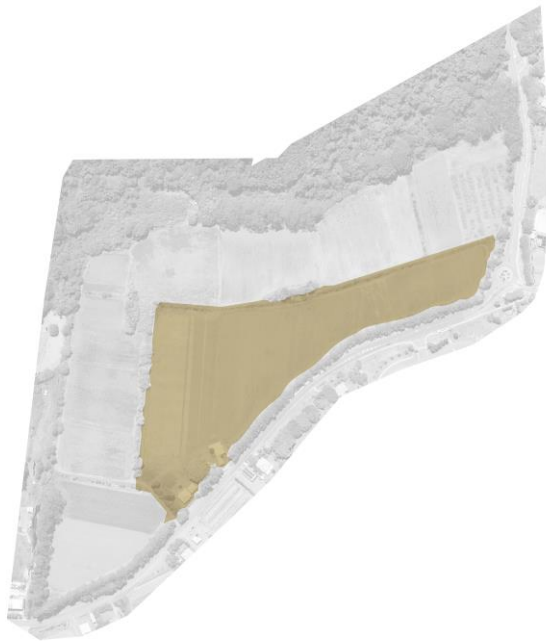


#### 3.2.1. Sown Crops

The remaining sweet potato patch has been left un-kept for some time. Weed encroachment has occurred, and the potatoes (when inspected) were exhibiting signs of water stress. Crop retention has been considered. However, the crop has developed to a stage where harvesting may occur. The following strategies are therefore provided for consideration:

- a) Make enquiries to assess the viability of a local farmer / Kingscliff TAFE market, harvesting and on-selling the crop. Additional investigations regarding former farming practices would be required should this option be considered;
- b) Make enquiries to assess the viability of Client harvest and delivery of crop to local 'soup kitchens' / Oz Harvest, to serve those in need. Additional investigations regarding former farming practices would be required should this option be considered;
- c) Harvesting of the crop for use as stock feed. Additional investigations regarding former farming practices would be required should this option be considered;
- d) Carefully remove intercrop weed species (currently seeding) to prevent seed dispersal. Remove all sweet potato plant parts, foliage and tubers, and stockpile on site. The remaining summer heat will reduce the material into organic waste that can be blended back into site topsoils. The stockpile should be turned monthly to ensure any germinating weeds or crop are fully eradicated.

Once potato crop removal has occurred it is recommended that the area is treated with hydromulch as specified to North and Western banks.



### 3.2.2. Fallow Farm Lots

Fallow farm lots are largely located on the relatively elevated and flatter zones of the site. These areas are currently managed through slashing emerging weeds biweekly. This process is managing propagule spread through low and frequent slashing. Some weed seed was inspected, however, it is being greatly reduced under this strategy.

These areas will be subject to the greater majority of the proposed site development, comprising buildings, roadways, car parks and services. However, control of weed species is still recommended in accord with the following:

- Spray existing in-situ weeds with herbicide;
- Wait until all vegetative material has died;
- Cultivate back into the soil;
- Install hydromulch incorporating sterile cover crop seed;
- The species of cover crop must be appropriate to the season. Where time extends to the point of cover crops beginning to die off due to seasonal change, over-sow with new season species to maintain competition with weed species. Millet is recommended for the warmer months and Ryegrass for the cooler months. A mix of both species is appropriate when sowing between seasons;
- To ensure competition with weed seed germination a dense thicket of cover is required to be generated. To ensure extensive crop coverage assess germination success rate and apply additional seed as required to maximise coverage. The application of hydromulch must also ensure all site soil is fully covered to reduce soil bank seed germination from exposure to sunlight;
- Continue to manage emerging weeds with spot spraying of herbicide.



### 3.3.North and Western Banks / Sediment Basins



The north and western banks are currently under construction for the sites sediment basins.

Treatment of bare earth is required to prevent rapid establishment of weed species and to stabilise topsoil, minimising erosion.

Due to the bulk earthworks undertaken, site soils have been sufficiently modified and trafficked by machinery to minimise weed establishment. However, if left fallow bare soils will be rapidly colonised by weed seed due to surrounding sources.

At the completion of bulk earthworks it is recommended that areas of bare earth are cultivated to break up machinery compaction and treated with hydromulch. Hydromulch is recommended to provide a layer of mulch over the surface of the soil. This will assist in the reduction of soil bank weed seed germination. With the addition of native grass seed to the hydromulch a native grass ground cover will be generated offering little to no impact on surrounding farm lots or environmental zones. Utilising native seed within the hydromulch mix also provides opportunity for retention of native grasses in broad revegetation zones where not impacted by future construction works. Inter-planting with trees and shrubs can be undertaken as a successional planting strategy as part of the sites landscape construction contract.

Native seeds recommended for inclusion within the hydromulch based on Williams Northern Revegetation Native Mix. Mix subject to commercial availability:

*Themeda triandra* (Kangaroo grass);

*Bothriochloa bladhii* (Forest Bluegrass);

*Heteropogon contortus* (Black spear grass);

*Lomandra longifolia* (Spiny-head Matrush);

*Capillipedium spicigerum* (Scent Top Grass);

*Cymbopogon refractus* (Barbed Wire Grass); and

*Poa sieberiana* (Grey Tussock Grass).

Note: Red Natal Grass must not be incorporated into the seed mix. This is a native of Africa and is noted as a weed species by Brisbane City Council, and an environmental weed in Queensland and NSW.

Additional to native seed it is recommended that sterile cover crops are incorporated into the native hydromulch mix to provide more rapid seed establishment. Sterile cover crops will die off leaving the native grasses behind. Suggested sterile cover crops:

Millet - warmer months

Rye corn - colder months.

Seed application rates as recommended by supplier to ensure full coverage.

The application of hydromulch with native grass seed will not provide a foolproof strategy in terms of ongoing weed management. Weed seed will continually be dispersed by wind and bird droppings onto the site. Spot spray management of germinating weed seed is a key priority during the establishment of the native grass seed, and will be required periodically until the completion of construction works and hand over of the site.

It is noted that these native grasses will be located in part within the future Asset Protection Zone. Landscaping requirements for this area are outlined in the Bushfire Constraint Assessment, and future alterations may be required to minimise the potential impact of fire.

Specification notes for all hydromulch works:

- The contractor must not take possession of seed more than 7 days prior to sowing.
- The seed must be stored in clean, air tight containers in a dry dark place.
- If included plant species required dormancy to be broken, pre-treat by soaking in hot water or scarification on the day of use, prior to use in hydromulch.
- The mulch used in Hydromulching must consist of straw, chaff, wood fibre, paper pulp or similar material finely shredded to a maximum dimension of 10mm, at the rate of 1500kg/Ha (dry weight). Paper mulch must not exceed 50% by mass, and be free of seeds, weeds, or other plant species not specified for use in the plantings.
- A wetting agent must be used equal to 'Aquasoil' at a rate of 35ltr/Ha.
- Incorporate a Tackifier (typically 10kgs/ha) to bind mulch. The Tackifier must not contain polyacrylamides, and must undergo an ecological risk assessment and certification by an independent consultant ensuring no harm to adjacent environmental zones and waterways.
- Mix ingredients together in water at a rate of 35,000 ltr/Ha.
- Prepare site topsoil prior to installing hydromulch to ensure an uncompacted, friable bed for seeds to germinate and take root. Cultivation such as ripping; scarification; tine cultivation; and rotary hoeing etc are suitable methods.
- Dry surfaces must be watered prior to installation of Hydromulch.
- Hydromulch must be applied uniformly over the surface.
- Contractor to record environmental conditions at time of installation and submit to the principal's representative.
- It is recommended that hydromulch not be applied when temperatures are greater than 35 degrees C, when winds exceed 15km's/hr, during rain or when rain is imminent.
- The contractor must maintain hydromulched areas giving additional attention as needed to ensure successful germination and throughout the critical first weeks to ensure vigorous healthy plant growth is achieved.
- Maintenance of the Hydromulch must include regular watering to keep the wood mulch moist until the seed has germinated and the seedlings are established. Adequate watering is just as essential for hydromulching as it is for conventional vegetative establishment. Lack of water will limit germination.
- The mulch layer must be kept moist until full seed germination and establishment of young roots into the topsoil layer.

- Where possible, works are recommended to be undertaken during cooler months to minimise watering maintenance and assist establishment.
- Sprayed areas are to be fenced to prevent vehicle or pedestrian access until well established.
- Prior to installation the contractor is to provide a final seed mix with recommended application rates, percentage applications, and total seed weight per hectare, for review and approval.

### 3.4. Orchards



In the first instance it is recommended that advice be sought from the Department of Primary Industries (or an independent agricultural advisor) to ascertain the viability of the existing custard apple orchard for future harvest.

If viable, there are a number of options for management:

- Regular slashing will prevent weed growth, and seed development and spread across the site. This is potentially labour intensive due to the spacing and low-branching habit of the trees, and may cause inadvertent damage to them.
- The second option is to treat around the trees as per the north and western bank native hydromulch. The issues with this option are amenity and access (as the native grass species mix will grow to over 1m in height). This would not be an appropriate long-term solution if the intent is for the orchard to become a high amenity destination landscape for the hospital.
- The third option is to set the custard apple trees in mulched gardens, within a lawn paddock. To ease maintenance, a more prostrate lawn species is recommended with a reduced lawn maintenance regime (e.g. lawn cut only once a month).

### 3.5.Moderate / High Value Trees



Existing moderate and high value trees are currently set within tree protection zones, which should be maintained. Removal of all weed growth with the tree protection zone areas is recommended, followed by application of organic woodchip mulch equal to ANL Forest Blend, at a thickness of 100mm, ensuring that the existing topsoil is fully covered and not exposed to sunlight. This will minimise any weed seeds germinating. Additionally, ongoing weed removal maintenance will must be undertaken as required.

### 3.6. Environmental Area Boundary



Weed growth along the boundary of the environmental corridor and extending into the environmental area where moisture is prevalent was also identified at the time of inspection. Left uncontrolled these weeds will provide a stock of weed seed that would likely spread across the site. It is therefore recommended that a weed management strategy and revegetation strategy along the edge of the Environmental Area be prepared by the project ecologist.



## 4. SOIL MANAGEMENT

### 4.1. Condition of Existing Topsoil

'Preliminary Soil Management Advice' by Melaleuca Group (19<sup>th</sup> December 2019) concludes that: "in general, it is considered the soils are fertile Red Krasnozems. This characteristic along with the higher organic matter usually found in topsoils, would indicate a relatively valuable resource. However, assessments to date have noted rockiness. This could be corrected by screening during bulk earthworks. Further investigations would be required to demonstrate the financial viability of completing this. Of further note is the long-term cultivation of the site and lack of soil fertility testing. Long-term cultivation may have led to severe deficiencies within the soil despite the usual classification of the Cudgen soil landscape. Additional sampling and testing would enable full characteristics of the soil to be obtained for this component."

Where areas of contamination have been identified, additional assessment and appropriate management will be undertaken.

### 4.2. Volume of Existing Topsoil

It is noted that average depths of upper soils is likely to be approximately 0.35m ('Preliminary Soil Management Advice', Melaleuca Group, 2019). The approximate total area of topsoil that will be displaced due to development works is 109,000m<sup>2</sup> (refer appendix for Soil Displacement plan). It is therefore possible to estimate the total volume of topsoil that will be displaced as a result of the works:

$$\begin{array}{rclcl} 109,000\text{m}^2 & \times & 0.35\text{m} & = & 38,150\text{m}^3 \\ \text{(area of topsoil displaced)} & & \text{(average depth of topsoil)} & & \text{(volume of topsoil displaced)} \end{array}$$

### 4.3. Potential for Reuse

On the completion of bulk earthworks planning, it is advised a suitably qualified consultant completes a review of the plans to assist in determining the most appropriate handling of soils at the site.

#### 4.3.1. Potential for re-use on-site

It is preferable for the existing site soils to be utilised / managed on-site wherever possible. If (following additional testing) the topsoil is deemed suitable for use as growing media, the current Landscape Concept Plan includes a total planting area of 48,000m<sup>2</sup>. The typical soil profile for planting areas will be 300mm depth topsoil, therefore a total volume of topsoil required for the new works can be calculated:

$$\begin{array}{rclcl} 48,000\text{-m}^2 & \times & 0.30\text{m} & = & 14,400\text{m}^3 \\ \text{(area of new planting)} & & \text{(depth of topsoil profile)} & & \text{(volume of topsoil required)} \end{array}$$

#### 4.3.2. Potential for reuse off-site.

Three (3) options for reuse of excess natural materials off-site are provided in the 'Preliminary Soil Management Advice', Melaleuca Group, 2019.

These options include:

- Virgin Excavated Natural Materials (VENM);
- Excavated Natural Materials (ENM); and
- Specific Resource Recovery Order (RRO).

It is recommended that the 3 options provided by Melaleuca Group be investigated further to ascertain the most appropriate off-site use of the soil. It is also noted that there may be additional opportunities for reuse of topsoil on the site (e.g. for mounding, fill, etc) depending on the outcomes of further soil assessment and design development.

The topsoil volume calculations above can be used to provide an estimated total volume of surplus topsoil following re-use on-site for landscaping:

$$\begin{array}{rcl} 38,150\text{m}^2 & - & 14,400\text{m}^3 & = & 23,750\text{m}^3 \\ \text{(volume of topsoil displaced)} & & \text{(volume of topsoil required)} & & \text{(volume of surplus topsoil)} \end{array}$$

Please refer attached plans illustrating the site areas used to calculate the above figures.

#### 4.4. Soil Management Recommendations

The recommendations within this report outline short-term immediate strategies for topsoil stabilisation, and are to be read in conjunction with other relevant documents including the Construction Environmental Management Plans, and Sediment Control Plans outlined in the Civil design documents. A Biodiversity Management Plan is currently being developed prior to the commencement of Stage 1 works which will further inform the Landscape Management Plan.

Longer-term management of the site soil may include both re-use on-site and off-site. On completion of bulk earthworks planning, it is advised a suitably qualified consultant completes a review of the plans to assist in determining the most appropriate handling of soils at the site.