

Welcome to Pine Gully

Marni naa pudni
Kaurna yarta-ana



PINE GULLY MASTERPLAN DRAFT

FEBRUARY 2021

Acknowledgement of Country

The City of Holdfast Bay acknowledges the Kaurna People as the traditional owners and custodians of the land. We respect the spiritual relationship with Country that has developed over thousands of years, and the cultural heritage and beliefs that remain important to the Kaurna People today.

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SUMMARY

Pine Gully is one of four designated natural areas in our city. It is a natural space for the community to enjoy and provides habitat for local wildlife.

Pine Gully is located between Kingston Crescent, Myrtle Road and Pine Avenue in Kingston Park.

Managing the gully to ensure sustainable use into the future is a priority of the City of Holdfast Bay. This masterplan has been developed to provide objectives and strategies to manage Pine Gully for the community.

The masterplan for Pine Gully has involved an assessment of opportunities and constraints, together with reviews of the environment, landscape and infrastructure. The recommendations that have been developed from the masterplan process will protect and enhance the local biodiversity, improve access and safety for the community, and improve the amenity and beauty of Pine Gully.

Pine Gully is a natural, steeply sloped space that follows an ancient watercourse and it is likely that the area was visited by the Kaurna People. After European settlement, the gully had some of the native vegetation cleared. Non-native plants, such as Aleppo pines, were replanted in some areas to stabilise the steep slopes. There is the opportunity to improve the local biodiversity by selectively removing non-native plants and planting appropriate local native species.

The gully has a number of informal trails throughout, including in some steeply sloped areas, which contribute to erosion. There is the opportunity to formalise some of the trails in the flatter sections of the gully and improve access points to the area for the community. Access to unsafe trails in steep areas will be restricted to allow revegetation to occur. This will assist with reducing erosion, improving revegetation efforts and enhancing the visitor experience.

Stormwater harvesting and reuse opportunities have been considered for Pine Gully, however the implementation of any reuse scheme is unlikely to be viable. The recommendations from the masterplan focus on reducing erosion and improving water quality, through appropriate revegetation, bank stability and trail improvements, and some stormwater infrastructure upgrades.

Pine Gully is already a natural space that is enjoyed by the local community. Implementing the masterplan recommendations will increase the appeal of the area and contribute to enhancing the enjoyment that residents and others gain from using the gully. This masterplan provides the direction to ensure the sustainable use of Pine Gully for future generations.

ABOUT THE MASTERPLAN

PURPOSE

This document is a high-level plan that sets the objectives and strategies to manage Pine Gully for the community of the City of Holdfast Bay.

VISION

Our vision for Pine Gully is to:

- Protect and enhance local biodiversity
- Provide a natural space for the community to enjoy
- Improve amenity and beauty
- Connect people with nature in different settings
- Encourage appropriate use of the natural space
- Manage stormwater in a sustainable way

MASTERPLAN PROCESS

The masterplan for Pine Gully has involved the assessment of the opportunities and constraints of the area, as well as reviews of the existing environment, landscape, and infrastructure. Recommendations for stormwater management, landscape and vegetation have been developed and are outlined in this document.

INTEGRATION WITH OTHER STRATEGIES AND PLANS

This masterplan has been considered in conjunction with a number of Council's existing strategies and plans, including:

- Environment Strategy 2020
- Open Space and Public Realm Strategy 2018 - 2030
- Masterplans for Barton Gully and Gilbertson Gully.

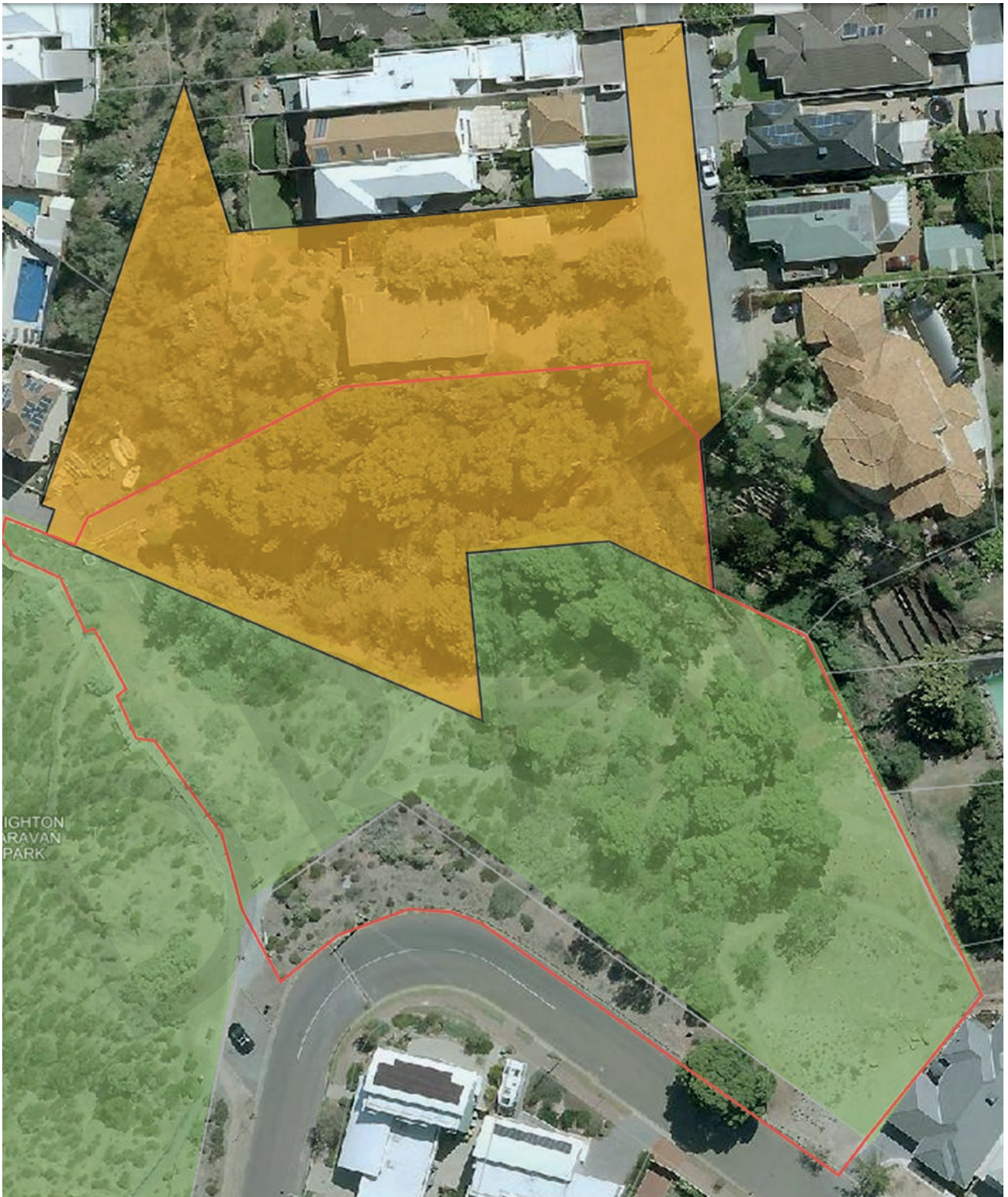


Figure 1. Location of Pine Gully (outlined in red); area in orange is owned by Mrs Mary Trott. The portion of orange inside the red line is the area under care and control of the City of Holdfast Bay.

ABOUT PINE GULLY

Pine Gully is located between Kingston Crescent, Myrtle Road and Pine Avenue in Kingston Park, and is one of four designated natural areas in our city. Pine Gully is a significant natural space that follows an ancient seasonal watercourse through a residential area.

The Gully does not currently allow for defined access to the beach but there is an informal trail network that does provides access to the beach.

Pine Gully ownership is complex and includes land under the care and control of the City of Holdfast Bay (donated by Mrs Mary Trott), portions owned by the City of Holdfast Bay and portions owned by a number of private owners but unfenced due to the steep slope of the land. The area shown as orange is land owned by Mrs Mary Trott of which a portion in the gully is under the care and control of the City of Holdfast Bay

HISTORY

Prior to European settlement, Pine Gully was a place where the Kaurna People of the Adelaide Plains would frequent and camp during the summer months. The gully would have supported local native wildlife and been vegetated with local species which would have provided important food resources and shelter. Pine Gully is also located close to the sacred Tjilbruke Springs.

After Europeans settled in South Australia, clearing of some of the native vegetation occurred. Following a natural watercourse with increased flow as a result of urbanisation, the gully is prone to erosion during rainfall, particularly with the removal of native vegetation.

ACTIVITIES UNDERTAKEN

Revegetation was undertaken in the 1970s by community groups, using mainly pine trees and other species that were considered to be appropriate at the time. This included Aleppo pines, which now provide a valuable food source for the native yellow-tailed black cockatoo, which is listed as Vulnerable under the National Parks and Wildlife Act.

The main pathway through the gully, in the southern area, was recently upgraded, along with new location signs.

Careful removal of some non-native trees and recent revegetation has been undertaken by Council and volunteers consistent with this masterplan's recommendations.

Some temporary fencing has been installed to discourage bicycle access, which was uncontrolled and causing significant erosion.

Some of the upstream areas of the gully appear to have been filled with material from unknown sources, possibly from local house construction. This fill is unlikely to have been compacted and accordingly has a high risk of erosion.

Council has undertaken an on-site consultation with the Kaurna Nation and received advice about the proposed works.

OPPORTUNITIES AND CONSTRAINTS



Figure 2. Opportunities and constraints.

KEY

1. Sediment removal upstream of headwall and reprofiling channel upstream with revegetation. High energy environment with moderate sediment loads. Insufficient area for secondary or tertiary water quality treatment reduce blockage risk at headwall.
2. Removal of selected Aleppo Pines to reduce fire risk and help increase light penetration to bottom of gully to support revegetation
3. Reprofile channel and rock armour base. Revegetation along the channel. Rock size to be confirmed based on design velocity. Reconfigure stormwater outlets from adjacent properties into the rock armouring. Remove exotic trees progressively and revegetate with natives
4. Remove section of fence spanning the channel or replace with more appropriate structure. Confirm boundary location and fencing with property owner.
5. Extend existing pipe with drop structure to reduce energy at stormwater outlets to open channel in Pine Gully.

The various opportunities and constraints presented by the site have been evaluated in terms of stormwater management, landscape and vegetation. A summary of the evaluation is provided below, with the locations of the opportunities and constraints shown in the attached plan (refer to Figure 2). It is also important given the cultural significance of the site that any planned works carried out in the area be planned in consultation with Kaurna. A review of Pine Gully was undertaken with Kaurna Representatives in September 2019.

STORMWATER MANAGEMENT

Pine Gully is quite steep in places, with a large, steep upstream catchment and therefore when it rains, water flows quickly through the gully, causing erosion and carrying vegetative material and sediment out of the gully into Gulf St Vincent.



Figure 3. Erosion on steep embankment.

There is the opportunity to improve the management of stormwater within the gully by implementing measures that reduce erosion and improve the quality of the water before it leaves the gully.

Additional stormwater infrastructure improvements such as installing new underground stormwater pipes, rock lining segments of the watercourse, rock check dams along the bed of the drainage watercourse together with revegetation of eroded sections of the watercourse with native species and reshaping of embankments to provide increased bank stability need to be implemented to reduce erosion. In addition, collecting gross pollutants prior to discharge to the ocean is an integral part of the stormwater solution and this may include a gross pollutant trap between the gully and the outfall to the coast.

In addition to the watercourse improvements, a number of property drainage outlets create localised erosion and are unsightly. These will need to be addressed as part of the masterplan works.

Access to undertake watercourse rehabilitation will be a significant challenge due to the steep slopes and existing vegetation and accordingly it will need to be completed as an early task to allow revegetation of disturbed surfaces.

Refer to Appendix A for further information on the identified stormwater improvements.

The viability of harvesting stormwater from Pine Gully for reuse (such as irrigation) was evaluated, refer to Appendix B for details. The evaluation determined that the opportunity for stormwater harvesting and reuse is limited due to factors such as the steepness of the gully and lack of suitable areas for stormwater capture and storage. There may be the opportunity to utilise a storage tank located on the adjacent caravan park for some stormwater capture, however additional water treatment would be required before reuse.

LANDSCAPE

Pine Gully is constrained by the steep embankments that are significantly eroded in areas, whilst the remaining embankments and watercourse, particularly on the southern slopes, are heavily infested with weed species making much of the gully inaccessible.

Plants suitable for the sloping site will help to maintain the integrity of the soil and mitigate further erosion. Currently the Aleppo pines drop significant pine needles that, in combination with the low light from the extensive tree canopy, reduce opportunity for understorey revegetation. Maintaining soil stability whilst revegetating will also be important, to ensure that additional erosion does not occur before new plantings are established.

There are a number of informal trails that traverse the southern and flatter part of the gully, with some native vegetation. Multiple narrow, unformed trails currently traverse the steep slopes of the gully causing erosion, particularly those that have been utilised by mountain and BMX bike riders (refer Figure 4). There is the opportunity to formalise existing sections of the trail network within the flatter sections of the gully and close off access to the unsafe steeper trails. This includes a short new path through the flat section of the upper southern part of the gully.



Figure 4. Informal bike trail.

Paths are proposed to be low key unsealed trails constructed from materials such as cement treated sands or cement treated rubble. The paths would be typically 1.0 to 1.5 m wide. Where possible, the paths will be designed so that they are accessible for all ambulant users. Small sections of paths to vantage points will be prioritised for wheelchair access where possible.

Educational signage could be provided throughout the site to coincide with the restoration and revegetation works. Interpretative signage could include information about:

- Weed control
- Kurna and European history
- Native flora and fauna
- Water management and treatment
- The role of volunteers and friends groups, providing contact details to encourage involvement.

The gully has been assessed for recreational use by BMX and mountain bikes and found that it is not an appropriate location for either of these uses. Use by cyclists on trails within the gully is not recommended due to conflicts with pedestrians on the narrow trails. The proposed educational signage at entry points to the gully could incorporate information about appropriate use.

There are a number of old fences that may be on current or former property title alignments. One in particular crosses the watercourse and has created a drop step in the watercourse. Removal or management of the fences is considered highly desirable.

VEGETATION

There are several areas of revegetation already on the site, however, additional areas would benefit from rehabilitation and planting of indigenous vegetation. There are many established Aleppo pines (*Pinus halepensis*) across the site. These trees create a carpet of pine needles that inhibit understorey growing conditions, with a large part of the site underneath the pine trees devoid of any other vegetation. They are a declared weed in South Australia and present a significant fire hazard.



Figure 5. Aleppo pine.

Slopes that currently do not have any indigenous vegetation could be revegetated to stabilise and encourage water infiltration. This would need to be carefully staged with uplifting of the Aleppo pine canopy to allow more light to the understorey area. The watercourse is currently inundated with large woody weeds and weed tree species due to garden escapees and seeds that have been introduced through the stormwater systems as well as via wind and birds. These will all need to be removed to enable the stormwater infrastructure to be installed. However, two river red gums have been identified in the watercourse and these are proposed to remain.



Figure 6. Steep slope.

Control of weeds and establishment of new (appropriate) vegetation can be challenging due to the steep site and restricted access in some areas. A biodiversity management plan, including weed control and management recommendations, will be prepared and implemented, to protect the revegetated areas and reduce re-infestation by unwanted plants.

The control of any potential bushfires in the gully is also a consideration, given the limited access and steep slopes. The bushfire risk can be reduced through careful selection of appropriate plants for revegetation and removal of fire-prone plant species, such as Aleppo pines. Improved access and more formal trails within the gully will also improve bushfire control. Where tree removal is proposed, stumps and root structure will remain to maintain slope and soil stability.

The opportunity to improve the existing biodiversity within the gully by continuing to revegetate areas and remove unwanted plant species will also increase the bank stability. In addition, this will enhance the natural beauty of the area and encourage native animal and bird species. Revegetation activities are planned progressively in the future.



Figure 7. Pine Gully revegetation.

VEGETATION ZONES



Figure 8. Vegetation zones.

KEY

ZONE 1 - HIGH WIND EXPOSURE

- Very shallow topsoil, lack of soil moisture, exposure to foot traffic and coastal wind.
- Encourage better coverage of *Themeda triandra* (Kangaroo Grass).
- Mulch exposed soils and balanced fertiliser
- Water during first year

ZONE 2 - ROADSIDE GRASSES

- Hand removal of young seedling regrowth from introduced shrubs
- Control annual grasses with foliar application of sugar solution
- Mow/slash in August to reduce annual grass setting seed.
- Slow release fertiliser to assist native grass

ZONE 3 - BETTER NATIVE STRUCTURE AND FEWER WOODY WEEDS

- Continue low impact approach
- Replant clumps of *Allocasuarina verticillata*

ZONE 4 - WOODY WEEDS, SOME UNDERSTORY AND OPEN AREA

- Area of introduced species such as Athel Pines
- Replant open areas to a coastal woodland

ZONE 5 - OPEN AREA

- Remove Olive species, retain Athol Pine and Pepper Trees.
- Replant batter with Native pines
- Planting of *Lomandra effusa*, *Dianella revoluta* and *Atriplex semibaccata* near property boundary

ZONE 6 - SOUTHERN EDGE OF DRAINAGE LINE

- Remove woody weeds
- Control soil erosion
- Replanting of *Lomandra effusa*, *Dianella revoluta* and *Atriplex semibaccata*, *Themeda triandra* and overstorey planting of *Allocasuarina verticillata*
- Include irrigation, mulch and fertilizers in revegetation actions

ZONE 7 - DRAINAGE LINE (WATERCOURSE)

- Clearing of a path for water and light along drainage line
- Planting of watercourse with *Facinia nodosa* and *Cyperus sp* to control silt movement
- Continuous control of woody weed seedlings
- Improve water quality through further investigations and design

ZONE 8 - STEEP BANKS

- Remove trees near drainage line
- Remove new growth of weed species seedlings annually
- Staged removal actions carefully to minimise visual impact

Pine Gully has been divided into nine distinct vegetation zones, based on the existing vegetation and landscape features. These vegetation zones will be used to assist with revegetation and weed control. The following vegetation zones are shown in Figure 8:

- Zone A: High wind exposure
- Zone B: Roadside grasses
- Zone C: Better native structures and fewer woody weeds
- Zone D: Woody weeds, some understorey and open area
- Zone E: Open area
- Zone F: Open grassland area
- Zone G: Watercourse
- Zone H: Steep banks
- Zone I: Private access trails area

A description of each zone and proposed management actions for each of the zones are provided in Appendix C. The list of plant species to be removed or controlled is provided in Appendix D and plants to be used for revegetation are provided in Appendix E.

MASTERPLAN RECOMMENDATIONS



Figure 9. Pine Gully masterplan recommendations.

KEY

1. Define entry
2. Revegetate to define entry and demolish existing plinth and install seat with inground footings, and align with trail.
3. Relocated rock/signage to highlight trail into gully
4. Trail link to coast trail
5. Existing Pine Gully steps
6. New tree planting along steep embankments. Selective removal of Allepo Pines
7. Retain link to Pine Avenue
8. Define existing access into site
9. Lower head wall and modify pipework to accommodate new compacted gravel area, to provide access for trailer and maintenance vehicles to gpt. Improve access to and around existing headwall
10. Possible location for gpt
11. Informal trails upgraded
12. Watercourse with rock check dams
13. Undertake pest plant removal and re-vegetate embankment.
14. Realign trail
15. Earthworks, lay back top of embankment.

The masterplan for Pine Gully has been based on findings from assessment of the opportunities and constraints, existing environment, landscape, and infrastructure.

The recommendations outlined in this section provide direction to enhance the existing biodiversity, improve stormwater management and improve access for the community to enjoy the natural environment provided by Pine Gully. Figure 9 shows the location for each of the recommendations.

STORMWATER MANAGEMENT

Stormwater management within the gully will focus on stabilising embankments, reducing erosion, and improving water quality. Landscaping elements and vegetation will be used to assist with achieving these goals, in addition to the repair/remediation and installation of new stormwater infrastructure. An assessment of stormwater capture and reuse opportunities has indicated that based on economics, aesthetics and low water demand for revegetation species, it is not viable to capture water for reuse within the gully.

LANDSCAPE

Trails will be formalised to reduce erosion and improve establishment of revegetated areas. Access to unsafe trails will be prevented in steeper areas, allowing revegetation and bank stabilisation to occur. A new trail is proposed to link Pine Avenue east with the coast. Educational signage will be installed to highlight the key features of the area such as the vegetation, water management, Kauria and European history and local volunteer groups.

VEGETATION

A biodiversity management plan will be developed and implemented, including removal and treatment of priority weeds. Revegetation will continue in the identified vegetation zones with appropriate plant species as described in Appendix E.

CONCLUSION

Pine Gully is a natural space that is enjoyed by the local community. Implementing the masterplan recommendations will increase the appeal of the area, improve the biodiversity and contribute to enhancing the enjoyment that residents and others gain from using the gully. The masterplan provides direction to ensure the sustainable use of Pine Gully for future generations.

IMPLEMENTATION AND FUNDING

The proposed works are planned to be coordinated and funded by Council with work completed by contractors with support of local volunteers. External grant funding would be actively sought as available.

Major works such as watercourse rehabilitation would be implemented initially, and other works undertaken in stages over a number of years.

It is expected that the capital works within Pine Gully would cost in the order of \$550,000 - \$600,000.

A draft implementation plan is included in Appendix F.

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APPENDICES

Appendix A – Identified stormwater improvements

Appendix B – Stormwater reuse assessment

Appendix C – Vegetation zone management actions

Appendix D – Vegetation for removal

Appendix E – Vegetation to be used for revegetation and biodiversity improvement

Appendix F – Draft implementation plan

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APPENDIX A

IDENTIFIED STORMWATER IMPROVEMENTS

GROSS POLLUTANT TRAP

A Gross Pollutant Trap (GPT) downstream of Pine Gully could reduce the gross pollutant load from all contributing catchments entering the coastal catchment. Management of pollution from the upstream catchment (refer following figures) will assist in maintaining the watercourse in good condition.

The gully and creek generate sediment and vegetation loads that should reduce with uptake through vegetation and other watercourse stabilisation measures.



Figure 10. Downstream of upstream outfall.



Figure 11. Upstream outfall.

DROP PITS

An engineering survey of the watercourse bed profile in the reserve indicates a steep bed grade (approximately 17%) immediately downstream of the 750 mm Reinforced Concrete Pipe (RCP) drain outlet into the reserve. This grade, in combination with high flows leads to severe scour issues as evidenced on site. In order to mitigate this problem, it is proposed to have 3 drop pits with a 1050 mm diameter pipe entering the gully in a 2100x600 mm culvert. This will reduce velocities of the discharge flows as well as transition flows onto a flatter downstream grade of the watercourse. This extension of the stormwater pipe will allow a particularly steep and unstable section of the gully to be filled to improve the overall amenity and access.

GULLY WATERCOURSE EROSION

The watercourse through the gully shows signs of erosion at several locations of both bed and creek batters (refer Figure 10). It is recommended that eroded areas be remediated, and erosion protection measures implemented to minimise future ongoing erosion. The following solutions are proposed:

- Rock beaching upstream and downstream
- Turf reinforcement mat with vegetation.

APPENDIX B – STORMWATER REUSE ASSESSMENT

CATCHMENT SIZE

Approximately 99 hectares.

CATCHMENT TYPE

- 89 hectares rural, relatively steep with rainfall runoff discharging quickly once catchment is wet
- 10 hectares urban, relatively steep, with rainfall runoff discharging quickly Potential runoff for capture
- 50ML per year

PEAK FLOW

- The peak flow within Pine Gully at the downstream end of the gully in a 5 year ARI is around 2 m³/s and 3 m³/s in a 100 year event limited by the upstream pipe capacity.

Implementing a viable stormwater harvesting and reuse scheme requires a balance between engineering feasibility and the economics of the scheme.

The determination of harvestable volumes of stormwater for reuse schemes includes an engineering assessment of a range of implementation and practicality factors, including:

- Total catchment runoff, and importantly the flow profile (ie proportion of low base flows versus peak flows)
- Size and capacity of wetlands/retardation basins to capture and treat runoff (land availability considering site constraints)
- Diversion weir capacity
- Wetland abstraction rates (i.e. diversion from the wetland to either storage or directly to demand)
- Storage of the harvested volumes for a time when demand requires
- Overall demand.

Based on this assessment of the Pine Gully site, a range of factors were identified that would limit the potential for stormwater harvesting including:

- Catchments are generally steep and responsive, meaning runoff will pass through the site quickly and over a short period, limiting opportunities for harvesting.

- Site constraints such as topography and shape, and existing and desired aesthetic appeal of the site including re-vegetation during community programs, mean that provision of retardation/storage of surface water and wetland treatment will be substantially constrained without wholesale landscape changes and /or increased risk of flooding impacts on adjacent properties.
- Geological profiles in these locations would mean any Managed Aquifer Recharge (MAR) Schemes to provide a longer-term storage would be in fractured rock, which traditionally are less suited to MAR schemes. With the gully in an elevated position and so close to the coast, this substantially increases the likelihood that any stored water would dissipate to the coast and be lost. Furthermore, hydrogeological investigations would be costly relative to the relatively small volumes of water that could be captured. It is understood that several springs exist along this section of the coast, one of which has cultural significance, and a fractured rock MAR scheme may impact on these springs.

Further high-level catchment and site assessments to investigate the potential and practicality of stormwater harvesting at the sites is summarised below:

SITE CONSTRAINTS AND OPPORTUNITIES

- Constrained site with existing community plantings and aesthetic appeal
- Limited space for storage and treatment of stormwater
- 100kL underground storage tank located in the adjacent caravan park may provide stormwater storage opportunities but would require treatment of any harvested

CONCLUSION

As the gully is currently not irrigated and revegetation is proposed with drought tolerant native species, the conclusion from this high-level assessment is that based on economics, aesthetics and water for irrigation, it is not viable to capture water for reuse within the gully.

APPENDIX C – VEGETATION ZONES MANAGEMENT ACTIONS

ZONE 1 – HIGH WIND EXPOSURE

The most significant management issue here is the shallowness of the topsoil, coastal wind and lack of soil moisture. The condition of the site suggests the following:

- High loss of overstory species
- Few restoration actions in the past.

Recommended management actions:

- Encourage better coverage of *Themeda triandra* (Kangaroo Grass) that still grows in this Zone
- Control foot traffic and public access off-paths
- Mulch exposed soils with a soil conditioner
- Consider watering during the first year after planting



Figure 12. Zone 1 high wind exposure.

ZONE 2 – ROADSIDE GRASSES

The site is weed infested with mostly annual grasses. However, it also has a very good mix of native grass species that can be improved with appropriate management.

Recommended management actions:

- Hand remove any young seedling regrowth from introduced shrubs
- Consider the use of non-chemical methods to control annual grasses
- Mow/slash the site in early spring to reduce annual grass seeding



Figure 13. Zone 2 roadside grasses.

ZONE 3 – BETTER NATIVE STRUCTURE AND FEWER WOODY WEEDS

Recent restoration works have been undertaken at this site by removing introduced trees and replacing with native species. This zone demonstrates what is achievable - the rest of the site requires similar treatments.

Recommended management actions:

- Continue with methods used, that is, a low impact approach allowing nature to recover before large areas of introduced species are removed
- Consider replanting clumps of Drooping Sheoak (*Allocasuarina verticillata*)
- Mulch any replanting to conserve soil moisture



Figure 14. Zone 3 native vegetation.

ZONE 4 – WOODY WEEDS, SOME UNDERSTOREY AND OPEN AREA

This Zone contains a few large Aleppo Pines that are naturally seeding. It also has open areas where new plantings could easily occur and there is a walking trail that passes through this Zone.

Recommended management actions:

- Consider replanting open areas to a coastal woodland



Figure 15. Zone 4 revegetation.

ZONE 5 – OPEN AREA

This Zone is next to neighbouring properties; it is relatively open and has been used as a play area for BMX bikes. Significant replanting has occurred in this Zone (see Figure 7)

Recommended management actions:

- Undertake re-vegetation to the batter to native pines (*Callitris gracilis*)
- Use *Lomandra effusa*, *Dianella revoluta* and *Atriplex semibaccata* as smaller species near houses to reduce bushfire risk.



Figure 16. Zone 5 revegetation.

ZONE 6 – ALONG SOUTHERN EDGE OF DRAINAGE LINE

The condition varies along the length of this drain that consists largely of a steep embankment. Various woody weeds occur and should be selectively removed including olives, pepper trees, aloe, athel pines and Aleppo pines. Localised locations of batter erosion are also evident. This is a Zone that could be treated and replanted prior to attempting the northern side batter.

Recommended management actions:

- Carefully remove woody weeds in a staged approach
- Control any possible soil erosion
- Replant to species including *Lomandra effusa*, *Dianella revoluta*, *Atriplex semibaccata*, *Rhytidosperra caespitosa*, *Themeda triandra* and *Allocasuarina verticillata* as the overstorey species.



Figure 17. Zone 6 vegetation on batter and drainage line.

ZONE 7 – DRAINAGE LINE

This Zone consists of a highly modified drainage line containing a significant level of introduced tree species including desert ash, red gum (planted), Aleppo pine, olives, silver poplar, and others. There is also a quantity of rubble/mortar that has been dumped here, which is affecting water flow. High level of shading is apparent. Water comes from a drainage pipe entering at the eastern end of the gully where the velocity of the water has caused erosion.

Recommended management actions:

- Clear vegetation to allow light into the drainage line to enable regrowth of any sedges
- Plant with watercourse plants such as *Ficinia nodosa*, *Juncus pallidus* and *Cyperus spp.* to assist with control of silt movement down the watercourse. These plants should be integrated into the scour protection works proposed.
- Continuous control of woody weed seedlings is important



Figure 18. Zone 7 drainage line.

ZONE 8 – NORTHERN STEEP BANK

This area is overgrown by olives and Aleppo pines and the removal and control of these, whilst possible, may reduce wind protection and visual screening to adjoining properties. Removal of the Aleppo pines here would also significantly reduce the food load available to the yellow-tailed black cockatoos who are known to feed here. The trees are both large and numerous and any removal will be a significant undertaking. Other areas of the reserve should be treated to provide wind shelter before the removal of these trees is considered.

Recommended management actions:

- Remove only those trees near to the drainage line in order to fulfil the concept of improving water quality discharging into the ocean
- Remove new growth of seedlings annually
- Stage any removal actions carefully to minimise visual impact
- Thin out Aleppo pines to reduce fire risk whilst maintaining root structure to minimise erosion
- Uplift the canopy to approximately 2.5 metres off the ground to reduce fire hazard
- Maintain sufficient trees to provide food for yellow-tailed black cockatoos.



Figure 19. Zone 8 dense Aleppo pines.

APPENDIX D – VEGETATION FOR REMOVAL OR CONTROL

The following trees and shrubs are invasive and/or non-native. They will be gradually replaced with more appropriate species (refer Appendix E) or controlled.

COMMON NAME	BOTANICAL NAME	COMMENT	STATUS
Western Coastal Wattle	<i>Acacia cyclops</i>	Sleeper woody weed. Becomes dominant. Needs checking for seedlings.	
Aloe	<i>Agave americana</i>	Requires careful removal due to thorns and caustic sap	
Galenia	<i>Aizoon (Galenia) pubescens</i>	Can assist in reducing soil erosion	
Bridal Creeper	<i>Asparagus asparagoides</i>	Potentially highly invasive climber	WONS* and SA declared weed
Mustard weed	<i>Brassica sp.</i>	Spreads by seed	
Boxthorn	<i>Lycium ferocissimum</i>	Seeds poisonous to people	WONS* and SA declared weed
Olive	<i>Olea europaea</i>		SA declared weed
Carrion flower	<i>Orbea variegata</i>		SA declared weed
Sour sobs	<i>Oxalis pes-caprae</i>		
Date palm	<i>Phoenix dactylifera</i>		
Aleppo pine	<i>Pinus halepensis</i>		SA declared weed
Rice Millet	<i>Piptatherum milliaceum</i>	Spreads in clumps on moist soils, prolific seed production	
Castor Oil Plant	<i>Ricinus communis</i>	Seeds poisonous to people	
Peppertree	<i>Schinus molle</i>	Becomes dominant	
Athel Pine	<i>Tamarix aphylla</i>	SA declared weed	WONS* and SA declared weed

* WONS = Weed of National Significance

APPENDIX E – VEGETATION FOR REVEGETATION AND BIODIVERSITY IMPROVEMENT

The following plant species present a mix of trees, shrubs and groundcovers that are suitable for use in revegetating Pine Gully.

TYPE	COMMON NAME	BOTANICAL NAME
Trees	Golden Wattle	<i>Acacia pycnantha</i>
	Drooping Sheoak	<i>Allocasuarina verticillata</i>
	Southern Cypress Pine	<i>Callitris gracilis</i>
	Dryland Teatree	<i>Melaleuca lanceolata</i>
	Native Apricot	<i>Pittosporum angustifolium</i>
Large to medium shrubs	Sweet bursaria	<i>Bursaria spinosa</i>
	Sticky Hop-bush	<i>Dodonaea viscosa ssp spatulata</i>
	Dwarf Hakea	<i>Hakea rugosa</i>
	Nitre bush	<i>Nitraria billardierei</i>
	Seaberry saltbush	<i>Rhagodia candolleana ssp candolleana</i>
Small shrubs	Ruby saltbush	<i>Enchylaena tomentosa</i>
	Mallee Bush-pea	<i>Eutaxia microphylla</i>
	White Goodenia	<i>Goodenia albiflora</i>
	Clasping Goodenia	<i>Goodenia amplexans</i>
	Small-leaf bluebush	<i>Maireana brevifolia</i>
	Wingless Bluebush	<i>Maireana enchylaenoides</i>
	Twiggy Daisy-bush	<i>Olearia ramulosa</i>
	Mallee Pomaderris	<i>Pomaderris paniculosa ssp. paniculosa</i>
	White fanflower	<i>Scaevola albida</i>

TYPE	COMMON NAME	BOTANICAL NAME
Groundcovers/climbers/ sedges/grasses/forbs	Prickly groundberry	<i>Acrotriche patula</i>
	Berry Saltbush	<i>Atriplex semibaccata</i>
	Feather Spear-grass	<i>Austrostipa elegantissima</i>
	Rusty Spear-grass	<i>Austrostipa eremophila</i>
	Tall Spear-grass	<i>Austrostipa nodosa</i>
	Bulbine-lily	<i>Bulbine bulbosa</i>
	Lemon beauty-heads	<i>Calocephalus citreus</i>
	Pink Garland-lily	<i>Calostemma purpureum</i>
	Common fringe-myrtle	<i>Calytrix tetragona</i>
	Spiny Flatsedge	<i>Cyperus gymnocaulos*</i>
	Stiff Flatsedge	<i>Cyperus vaginatus*</i>
	Black-anther Flax-lily	<i>Dianella revoluta</i> var. <i>revoluta</i>
	Climbing Saltbush	<i>Einadia nutans</i> spp. <i>nutans</i>
	Club Rush	<i>Ficinia nodosa*</i>
	Scrambled eggs	<i>Goodenia pinnatifida</i>
	Pale rush	<i>Juncus pallidus*</i>
	Scented Mat-rush	<i>Lomandra effusa</i>
	Austral trefoil	<i>Lotus australis</i>
	Coast tussock-grass	<i>Poa poiformis</i>
	Yellow tails	<i>Ptilotus nobilis</i>
	Pussy tails	<i>Ptilotus spathulatus</i>
	Wallaby Grass	<i>Rhytidosperra caespitosa</i>
	Kangaroo Grass	<i>Themeda triandra</i>
	Coast bonefruit	<i>Threlkeldia diffusa</i>
	Narrow-leaf New Holland daisy	<i>Vittadinia blackii</i>
	Pale twinleaf	<i>Zygophyllum glaucum</i>

APPENDIX F – DRAFT IMPLEMENTATION PLAN

ITEM	SCOPE	PROGRAM	BUDGET ESTIMATE
Watercourse rehabilitation	<i>Complete rehabilitation of the watercourse including tree removal, pipe extension and rock lining.</i>	2020/2021 and 2021/2022 FY	\$250,000 - \$300,000
Removal of Aleppo pines and other weed species	<i>Removal of some Aleppo pines and other weeds for fire safety and understorey improvement. Lift the canopy of the remaining Aleppo pines.</i>	2020/2021 and ongoing	\$100,000
Revegetation	<i>Revegetation of the gully based on the zones.</i>	2020/2021 and ongoing	\$100,000
Informative and Interpretative signage	<i>Supply and install signage</i>	2020/2021 and ongoing	\$50,000
Paths	<i>Construct improved trails within the gully.</i>	2021/2022 and ongoing	\$50,000
Ongoing maintenance	<i>Weed management and revegetation</i>	2022/2023 ongoing	\$20,000 / year increase in operational budget

Note:

- Budget is subject to annual Council approval and is a total budget exclusive of any grant or other external funding.
- The above costs are capital costs for new works. Existing assets will be renewed as part of Council's asset management planning.

DRAFT



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