

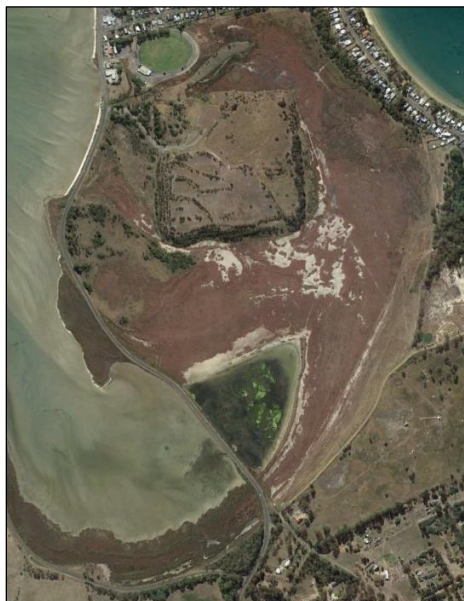


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Reserve Activity Plan

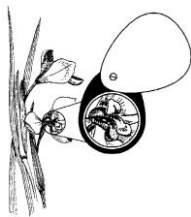
2020-2030

LAUDERDALE SALTMARSH RESERVE



ADVICE PREPARED BY NORTH BARKER
ECOSYSTEM SERVICES FOR CLARENCE
CITY COUNCIL

December 2019



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1 Introduction

1.1 Objectives and Outline

Clarence City Council intend for the Lauderdale Saltmarsh Reserves Activity Plan (RAP) 2019-2029 to fulfil three main objectives:

- Ensure the reserve is sustainably managed to preserve and enhance its natural, cultural and social values;
- Identify priority management activities to be undertaken within the reserve by Council and/or volunteer groups as resources become available; and
- Encourage community engagement through raising awareness of the reserve's values and encourage participation in activities to minimise threats to these values.

To facilitate these objectives, a process of extensive consultation has been undertaken within the local community and the extended scientific community. The process included revision of site-specific literature (Appendix A), a community event (Appendix B), interpersonal discussions with scientific stakeholders (Section 4), community groups and organisations (Section 4), and an invitation to the local residents to submit feedback and suggestions via mail, web submission(s), and/or in person via contacting the consultant (author) or the Council's project manager (Appendix A). All parties are also being given the opportunity to comment on a draft version of the report.

To meet the objectives and address the desires of the community, the RAP contains:

- A summary of existing literature relating to the natural and social values (including ecosystem services) of the Lauderdale saltmarsh system (Appendix A).
- Discussion of the degrading processes impacting on the ecological systems in the saltmarsh system (Appendix A and Section 5).
- A brief overview of the current surface conditions of the 9 ha disused tip site and an outline of passive recreation and restoration opportunities available for use of the site (Section 6).
- A community and stakeholder register demonstrating how feedback and specialist recommendations were incorporated into the above components (Appendices D and E).
- A series of recommendations for the future management of the saltmarsh system, including monitoring (Section 5 and Section 7).

1.2 Site Description

The Reserve Activity Plan covers a 120 ha area (Figure 1) roughly 20 km east of Hobart, adjacent to Ralphs Bay; the area includes:

- Racecourse Flats
- East Marsh Lagoon
- Doran's Road saltmarsh
- Disused Lauderdale tip site

Although the reserve area is being referred to as the Lauderdale Saltmarsh, the disused tip site area is not currently a saltmarsh ecosystem as this was replaced with the refuse dump and is now comprised of regrowth and revegetation. Saltmarsh however remains extant within Racecourse Flats, East Marsh Lagoon and Doran's Road; these three extant patches are referred to as the Lauderdale Saltmarsh System. The Lauderdale Saltmarsh System is the largest saltmarsh cluster in the Derwent Estuary¹, covering around 87 ha. Racecourse Flats covers an area of 68.5 ha within this system and is the largest single section of saltmarsh associated with the Derwent Estuary.

Although these discrete components are the core of the reserve, it is critical to acknowledge that saltmarsh components are part of an interconnected ecosystem complex including tidal mudflats, seagrass beds, rocky foreshores, marine ecosystems and adjacent terrestrial habitats. Due to this connectivity and inter-reliance, the RAP in several cases includes reference to the supporting habitats and makes specific management recommendations in relation to them when there is a benefit to the RAP area.

1.2.1 Tenure and Surrounds

Clarence City Council owns the titles and manages all of Racecourse Flats, East Marsh Lagoon, the Doran's Road saltmarsh section, and the disused Lauderdale tip (as well as the adjacent sports oval).

The Tasmania Parks and Wildlife Service (Department of Primary Industries, Parks, Water, and Environment - DPIPWE) manages the adjacent Ralphs Bay Conservation Area. The Department of State Growth manages South Arm Road, which intersects the Lauderdale Saltmarsh System.

The reserve area is bordered by mid-density residential land, the Lauderdale oval, and mostly cleared private land with fragments of remnant native vegetation. The Tangara Trail, used by walkers and horse riders, runs along the edge of Racecourse Flats.

2 Research and Reporting on the Reserve Area²

The reserve area is well studied and the management issues well understood. The following reports and studies have been investigated to inform the literature review (Appendix A) and the management recommendations (Section 5) (a full list of references is given in Appendix F).

Aquenal (2008a). Wader utilisation surveys in and around Lauderdale. Report for Cardno

Pty Ltd and Walker Corporation Pty Ltd. Aquenal Pty Ltd.

Aquenal (2008b) Surveys of wader prey species at Lauderdale and surrounding sites. Lauderdale

Quay Proposal. Report for Cardno Pty Ltd and Walker Corporation Pty Ltd.

Cook, F. (2012). Notes from site visit and scoping of Racecourse Flats saltmarsh restoration. Unpublished report for the Derwent River Estuary Program.

Derwent Estuary Program (2018). Increasing tidal flushing at Racecourse Flats Saltmarsh, Lauderdale – A brief to interested parties, March 2018.

¹ Prahalad et al., 2009; Prahalad 2012

² Including previous management recommendations and plans

- Derwent Estuary Program (2017). Increasing tidal flushing at Racecourse Flats Saltmarsh, Lauderdale – A brief to TLC from the Derwent River Estuary Program, 31 June 17.
- Derwent Estuary Program (2013). Advice: Derwent Estuary Program to DIER – South Arm Rd (Lauderdale) SHEET 0024 pipe upgrade from 360 to 450 mm.
- Harrison, A. 2008. Foraging ecology of the Pied Oystercatcher and other waders at Lauderdale and surrounding sites. Report for Cardno Pty Ltd and Walker Corporation Pty Ltd.
- McQuillan, P. (2013). Observation notes on two rare saltmarsh butterflies in south eastern Tasmania. Unpublished note supplied to Council.
- Ng, D. (2016). Change in a Tidally Isolated Saltmarsh in the Derwent Estuary, 2012-2016. Unpublished KGA300 Environmental Research Report, School of Land and Food, University of Tasmania.
- North Barker Ecosystem Services (2012) – with 2013 addendum. Lauderdale Salt Marsh Threatened Flora Survey. Unpublished report for the Derwent Estuary Program.
- North Barker (2008). Lauderdale quay vegetation and impact assessment. Report for Cardno.
- Prahalad, V. (2012). Vegetation Community Mapping and Baseline Condition Assessment of the Lauderdale Race Course Flats Saltmarsh, Derwent Estuary. Unpublished report for NRM South, Hobart, Tasmania.
- SGS Economics and Planning (2012). Tasmanian Coastal Adaptation Pathways Project – Lauderdale Recommended Actions.
- Whitehead, J. (2012). Lauderdale Environmental Assets: assessment of climate change impact on coastal and marine areas. Report prepared by the Derwent Estuary Program (DEP), for the Local Government Association of Tasmania (LGAT) as part of the Tasmanian Coastal Adaptation Pathways (TCAP) project in the Lauderdale area.
- Woxvold, I. (2008). A review of the populations, behavioural ecology and life history of Australian pied oystercatchers and migratory shorebirds common to the Derwent Estuary-Pittwater Area, south-east Tasmania.



Figure 1: Lauderdale saltmarsh reserve area (bound by red)

3 Community Concerns and Values

3.1 Community Consultation

Previous work around the Lauderdale area has found that local residents have a strong appreciation of natural values and acknowledge their contribution to the community lifestyle as well as property values³. As such, the community in general has a strong desire to protect and restore natural character as much as possible, which in the past has manifested itself in cohesive and effective community action against developments (e.g. the proposed marina-style development of Ralphs Bay) or in driving change in local government landuse (e.g. closing the Lauderdale tip).

The results of the current community consultation were broadly consistent with past trends, in that there was a strong response rate in relation to environmental factors and potential community recreation opportunities within the old tip site (Appendix C).

From the sample of 50 respondents⁴, 44 response themes⁵ emerged in 6 categories: passive recreation; environmental; socio-political; education and community; access (vehicular); and maintenance (Table 1).

Table 1: Variation in number of themes within response categories

Response theme category	Number of response themes
Passive recreation	16
Environmental	15
Socio-political	7
Education and community	4
Access (vehicular)	1
Maintenance	1

Thirteen response themes were mentioned by at least 5 % of respondents, with these dominant themes primarily being in the passive recreation and environmental categories (Table 2). The most frequently reported theme overall was the desire for more walking tracks (including mentions of maintaining/upgrading current track and linking track(s) to other areas). The next most frequent theme was in the environmental category and related to the understanding of the need for and support of tidal flushing within parts of the saltmarsh as means of improving ecosystem health. Two other themes were reported by 10 % or more of respondents, these being a desire for a disc golf course and the desire for more bike riding opportunities, both of which related to potential passive recreation use of the old tip site. The only theme from outside

³ Daniels (2011), SGS (2012)

⁴ Excluding a small number that did not include valid response themes

⁵ Themes were derived from collating community feedback into consistent management comments/desired uses, *etc.*

of the passive recreation and environmental categories to be reported by at least 5 % of respondents was the desire for interpretation and educational signage.

The desire for a disc golf course not only received a very high response rate but was subject to some of the more detailed submissions from the public. Several of the supportive responses for a disc golf course came from residents beyond the Lauderdale region (presumably encouraged from within the disc golf community), suggesting that a course would be likely to attract more than just local use, as was indeed suggested by several of the disc golf proponents. Purported potential benefits from a course included:

Economic:

- Relatively low costs of construction, maintenance and participation.
- Capacity to attract players to the community, due to general lack of courses in the region and the purported desire for more courses, particularly at the beginners end of the spectrum.

Health and safety:

- Innovative way to provide community members of all demographics a new avenue for outdoor exercise, with all the resultant benefits.
- Mental stimulation benefits due to nature of game.
- Increased public presence in area (potential to reduce crime, vandalism, *etc.*).

Educational:

- Local schools may be able to integrate classes with use of the courses, including lessons on physics (flight paths, *etc.*) and physical education.

Community involvement:

- Capacity to bring families and community together, through formal and informal participation or attendance.

These potential benefits are not unique to a disc golf course, but nor is the presence of a course incompatible with other passive recreation uses and the potential benefits of those. Indeed, the theme of the old tip site being capable of supporting multiple compatible uses was broadly evident across the entire pool of respondents, with most participants that made responses in relation to passive recreation opportunities listing multiple suggestions/preferences.

Table 2: Dominant response themes (with at least 5 % response rate)

Dominant response themes	Number of respondents (n = 50)	% respondents
Passive recreation		
Desires more walking tracks/maintenance of current track, and linkage to other tracks/areas	15	30
Desires a disc golf course	13	26
Desires/values bike riding opportunities	10	20

Desires bird hides/platforms and boardwalks for bird watching	7	14
Area seen as valuable resource for potential recreation benefits	6	12
Desires landscaped social area (park, gardens, BBQs, picnic facilities, playground, toilets, outdoor gym equipment, etc.)	6	12
Desires seating	5	10
Environmental		
Emphasises importance and supportive of tidal flushing for saltmarsh health	14	28
Values area for general biodiversity	8	16
Supportive of/desires planting of vegetation, including trees/arboretum	7	14
Specifically mentioned unblocking drains/engineering changes for saltmarsh flushing, some with reference to perceived responsibility of State Growth	6	12
Values area for its wildlife habitat, particularly birds	6	12
Education and community		
Desires interpretation/education signage	5	10

4 Stakeholder Input and Priorities

The following stakeholders were consulted for specialist input on a range of topics relating the Lauderdale Saltmarsh System. Stakeholder input was used to define and refine recommended management actions with respect to their specialist knowledge, responsibilities, and experience with the project area. Brief summaries of key priorities and discussion points are provided here, while more detailed notes from each meeting are given in Appendix E, with priorities aligning with recommended management actions noted in Appendix F.

4.1 Inger Visby – Derwent Estuary Program

Priorities from this stakeholder revolved around desires to improve general ecosystem health of the saltmarsh and improve the associated habitat values, including via the mechanism of restored tidal flushing. However, it was strongly emphasised the any recommended actions must be feasible to achieve in terms of financial costs and the capacity to have the outcomes maintained. Subsequently, an immediate priority is maintaining the flow of the existing culverts through a regular maintenance program, while exploring additional long-term tidal connectivity solutions.

4.2 Vishnu Prahalad – UTAS

Priorities from this stakeholder revolved around desires to improve the quality of the saltmarshes biodiversity values but also ensure we have a greater understanding of the values with improved monitoring and subsequent management. Suggested that a more achievable short-term goal may be improved environmental health via some restoration of tidal connectivity, but that the flow on effects of that in relation to overall biodiversity values may be longer term.

4.3 Eric Woehler and Mike Newman – Birdlife Tasmania

Priorities from this stakeholder revolved around the maintenance or improvement of habitat quality for resident and migratory shorebirds, with various observations and suggestions in relation to foraging, roosting and nesting opportunities.

4.4 Susan Hovington – Lauderdale Coastcare Group

Priorities from this stakeholder revolved around the long-term direction for the saltmarsh and the old tip site. Specifically, this related to longevity of components of the passive recreation area, long term goals for revegetation and restoration, and make sound planning decisions now that will allow for the consistent good management of the area into the future.

4.5 Tim Leaman and Mia Potter – Department of State Growth

Discussion with this stakeholder revolved around the issue of drain/culvert maintenance and the relationship of tidal connectivity to various conservation significant values and ecosystem processes.

It was stated that the Department currently does not have plans to upgrade South Arm Road and that it is unknown whether this will be considered a priority in future. The Department currently does not have allocated funding to replace the existing culverts with an alternative design to facilitate tidal connectivity and it is unclear whether the costs associated with the proposed culvert replacement for the purposes of saltmarsh management, rather than road asset management, would be a responsibility of the Department of State Growth as the road authority. The Department acknowledged their responsibility for maintenance of culverts in an unblocked state in accordance with their existing maintenance regimes and stated that this matter would be followed up internally with their maintenance team and relevant contractors to ascertain further details of the current maintenance regime

4.6 Karen Richards – Threatened Species Section, DPIPW

Discussion with this stakeholder revolved around the protection of threatened species and their habitats in the area, with a particular focus on threatened lepidopterans. Emphasised the importance of monitoring soil and water conditions (and their relationship to habitat condition) around the old tip site if the level of tidal connectivity is improved.

4.7 Matt Lindus and Rowena Hannaford – Parks and Wildlife

Discussion with this stakeholder revolved around their priorities in relation to the Ralph's Bay Conservation Area and concerns/desires about how actions related to this project might lead to conflicts or mutual benefits to their management of the conservation area.

4.8 Justin Burgess – Clarence Council (Natural Asset Management)

Discussion with this stakeholder revolved around their on-ground priorities and desires for the restoration of nativeness within vegetation on the old tip site and how their experiences on site might inform this.

4.9 Lauderdale Football Club

This stakeholder was contacted for a stakeholder contribution but did not respond.

5 Management Issues and Recommendations

5.1 Maintaining Lauderdale Saltmarsh Vegetation Communities

Saltmarshes are threatened nationally and recognised as being in decline across the Derwent Estuary due to human disturbance (including clearance, vehicle access, inappropriate fire regimes, weed invasion, altered drainage and landfilling), sea level rise (coastal squeeze), and coastal erosion⁶. The Lauderdale Saltmarsh System also suffers significant local impacts from altered tidal connectivity (Appendix A).

5.1.1 Tidal flushing/connectivity

5.1.1.1 Context

Tidal connectivity is recognised as a critical factor in maintaining condition within saltmarshes, so much so that disconnection from tidal movements is one of the condition criteria used to exclude patches of saltmarshes from the national threatened ecological community subtropical and temperate coastal saltmarsh⁷. The level of tidal influence is evident in the stratification of saltmarsh plant communities across inundation gradients⁸. Tides alter nutrient and sediment availability, salinity levels and waterlogging rates, which in turn influence the ecosystem functions via abiotic factors.

Within the Lauderdale Saltmarsh System, the construction of the South Arm Secondary Road causeway in the 1930s blocked almost all of the tidal connectivity between Ralphs Bay and Racecourse Flats, resulting in the formation of the East Marsh Lagoon, and separating Dorans Road saltmarsh area from Racecourse Flats (Figure 1). Alteration of the tidal connectivity in the area however started much earlier, with reported influence from a road and associated dikes in early settlement⁹. Currently three culverts are in place under the South Arm Road causeway to facilitate tidal flushing of Racecourse Flats and East Marsh Lagoon. However, due to a combination of factors relating to culvert size, design, and management (Appendix A), they are regularly partially or fully blocked by sand (Figure 2). Frequently only one 360 mm drain pipe is functional. In addition, this pipe slopes to the west, causing partial burial and restricted flow on the seaward (western) side, as well as preventing full drainage of the lagoon due to the elevated lip on the eastern side.

⁶ Prahalad (2009); Whitehead (2012)

⁷ DSEWPAC (2013)

⁸ Prahalad (2012); Ng (2016)

⁹ Ng (2016)



Figure 2: Blocked culvert (from DEP 2017)

The limited tidal connectivity has resulted in changes to the composition of the vegetation northeast of the road¹⁰ (Appendix A, Figure 3). The altered vegetation has had subsequent impacts on ecological values of the site¹¹ as well as interfering with ecosystem processes such as methane retention, carbon sequestration and nutrient cycling. Acid sulphate soil issues are also thought to be prevalent in Racecourse Flats, due to lack of inundation, and are thought to have contributed to subsidence of the flats by ~20 cm in height¹². The lack of flushing also impacts the East Marsh Lagoon, causing it to become eutrophic for periods of time.



Figure 3: Impacts to vegetation from lack of tidal connectivity, with Racecourse Flats above and Dorans Road saltmarsh below (from DEP 2017)

¹⁰ Ng (2016)

¹¹ Prahalad (2012)

¹² Cook (2012)

The ecological benefits of restoring tidal flushing to Racecourse Flats and East Marsh Lagoon are manifold, including:

- Improvement of habitat for some existing threatened flora and recreation of habitat for species present in the past (Appendix A.3).
- Improved habitat for shorebirds within East Marsh Lagoon in particular (Appendix A.4.3).
- Increased productivity amongst fish communities, potentially including species within commercial and recreational importance¹³
- The improvement of ecosystem services (Appendix A.5).
- The mitigation of greenhouse gas emissions and facilitation of carbon and methane sequestration (Appendix A.5.1).

5.1.1.2 Potential risks from reinstating tidal flushing and mitigation for these risks¹⁴

Although there are considerable potential flow-on benefits from restoring tidal connectivity across South Arm Road and reflooding East Marsh Lagoon and Racecourse Flats, it does come with some risks (all of which are manageable).

- Landfill leachates
 - Estimated by to be a relatively low risk of exacerbating with increasing tidal connectivity¹⁵ but raised as a concern by several stakeholders.
 - A comprehensive water monitoring program is required. This should include testing of ground and surface water, noting the influence of hydrology and the association with the potential redistribution of contaminants from the old tip site – in addition, should action 1 be implemented, any water captured in this area should be tested to see if it is contaminated before either being pumped into the saltmarsh or irrigated onto the revegetation on top of the landfill.
- **Management action 1:** As a precautionary measure it is recommended to install a short (20-50 cm high) bund around 10 m from the base of the landfill, to capture any surface runoff from the site and to prevent inundation from tidal or freshwater sources.
Note that alternative measures are available to this solution, such as controlling inundation to a level where the landfill isn't compromised. As such, the installation of a bund is only a contingency action in a scenario where full tidal flushing is to be restored and the need for a bund is identified in soil and water monitoring results (relating to management actions 2 and 3).
 - **Management action 2:** Develop a ground and surface water monitoring program
- Potential Acid Sulphate Soil (PASS)
 - Visual examination has suggested soils within Racecourse Flats have acid sulphate potential, which could exacerbate the release of contaminants including heavy metals.
- **Management action 3:** A survey of Potential Acid Sulphate Soils should be undertaken on site to accurately quantify the oxidation and acid potential.
- Habitat for conservation significant fauna
 - Increased tidal connectivity to Racecourse Flats is not expected to compromise conservation significant fauna habitat. Indeed, reflooding is likely to increase

¹³ Prahalad et al. (2018a)

¹⁴ Cook (2012)

¹⁵ Cook (2012)

- the diversity of prey for shorebirds in association with improved soil structure (less decay and greater organic matter) and vegetation condition.
 - Changes will however potential occurring due to the redistribution of habitat niches (e.g. potential shifts in lepidopteran food plants or changes in high tide roosting sites for shorebirds).
 - Monitoring will thus be critical to document changes in habitat quality and distribution (specific monitoring recommendations are made elsewhere, e.g. Section 5.3).
- Erosion
 - Wind erosion is currently a greater risk than water erosion, but this may vary within the reconnection of tidal flow and the re-establishment of historic drainage and inundation levels.
 - The use of pipes or culverts as the mechanisms for reinstating tidal connectivity will limit erosion events during storm surges and extremely high tides, as infrastructure of this nature will have inherent flow limits based on size and design.
- Impact on road infrastructure
 - Engineering considerations will be paramount with any attempt to reinstate tidal flow to Racecourse Flats.
 - Given current conditions (soil subsidence/decay, restricted water flow leading to potential build-ups) the existing road may benefit from restored tidal connectivity.
- Climate change and sea level rise
 - Failing to restore tidal connectivity will limit the capacity of the broader saltmarsh system to adapt to sea level rise with inland movement of different habitats.

5.1.1.3 Mitigation attempts and options

Simply increasing current pipe dimensions to a minimum diameter of 450 mm and aligning the internal bases of the pipes with the adjacent surfaces of the mudflats could potentially double flushing from the levels recorded in a 2012 assessment¹⁶ - one pipe was upgraded in this fashion in 2013.

Ideally however, a greater degree of tidal flow would be reinstated to allow a greater degree of soil and vegetation recovery, increase capacity for carbon storage and provide greater protection against climate change. To achieve this, The Derwent Estuary Program (DEP) have in the past (2013) scoped what infrastructure would be facilitate better flushing below South Arm Road. The Derwent Estuary Program (DEP) received in-principle support from Clarence Council & DIER (now Department of State Growth) to undertake this scoping process. Initial advice (Delta Consultancy) suggested a more effective design which would noticeably improve flushing, would involve at least four 450 mm pipes or a box culvert (900 mm H x 600 mm W), which is consistent with previous recommendations¹⁷. In the design scenario of four pipes, it has been recommended to install three level with the mudflats but have one perched directly above another one of the pipes. This stacked arrangement would allow a greater rate of flow during high tides, which would be more comparable to natural unimpeded flows. Any pipes or culverts installed should have flow controls flaps or sandbags) to allow management of flow rates if required. DEP have also undertaken investigations into the optimal depth and angle of

¹⁶ Cook (2012)

¹⁷ Cook (2012)

pipe placement. Note however that culverts need to be set at certain depths below pavement layers, and as such the State Roads Department would require engineering advice from the designer to determine if pavement construction depths and standards can be met whilst achieving the proposed layout

The DEP submitted a Federal Government grant proposal in early 2013 to the Biodiversity Fund, seeking funding support to install the infrastructure but were unsuccessful. Installation and associated expenditure, including hydraulic engineering advice, and before and after flora and fauna monitoring, has previously been costed at approx. \$120,000. This would need revising before any new potential project as it is suggested this cost may not be accurate.

In lieu of potential constraints (fiscal, political, *etc.*) with replacing the existing culverts with more adequate infrastructure, regular maintenance may be an alternative solution.

5.1.1.4 Additional considerations

- Crown Land Services representatives have in the past stated that they do not require any approvals for altering the hydrology within East Marsh Lagoon but have requested to be kept informed of what works occur and what future works are planned.
- Parks and Wildlife are the relevant authority for the adjacent Ralph's Bay Conservation Area and during stakeholder engagement specified various stipulations for how they would require works to be undertaken on their land (Appendix E).
- Department of State Growth are the authority for South Arm Road and during consultation expressed willingness to maintain the flow within current culverts through their standard maintenance regime.
- In all scenarios if it understood that and works or maintenance on the drains must be undertaken with the permission and understanding of the relevant authorities, both for transparency and for clarity of insurance responsibilities, *etc.*

5.1.1.5 Recommendations for addressing tidal flushing

- Develop a work plan and seek funding to reinstate tidal connectivity with four 450 mm pipes or a 900 mm x 600 mm box culvert. This process should include:
 - Identify a partial tidal flushing volume that poses little risk of activating landfill leachate or causing erosion at the Lauderdale landfill site (alternative temporary solution in the absence of bunding). Work towards full flushing.
 - Monitor habitat changes arising from partial flushing and risks to the Lauderdale landfill.
 - Prepare site for full tidal flushing by installing mitigation measures (management action 1) to reduce risk associated with the Lauderdale landfill site and leachate mobilisation.
 - Ensure appropriate drainage exists on the north-eastern side of Racecourse Flats, where the landfill site causes retention of surface water runoff.
 - Increase full tidal flushing to Racecourse Flats at a rate that enables the transition of plants to the new conditions, as supported by monitoring of change on vegetation.
 - Conduct suite of biodiversity assessments (some of which have specific management actions of their own) and monitoring plans to support and understand the restoration of saltmarsh communities – this should include values such and fish (including any commercial benefits) and mitigation of limiting factors on plant regeneration, such as rabbits.

- **Management action 4:** Reinstate, using a staged approach, the tidal flushing to Racecourse Flats.

- If the drain upgrades cannot be achieved (or as an interim solution), implement maintenance regime to regularly remove blockages from all three existing drains.

- **Management action 5:** Implement a maintenance program to remove blockages from three existing drains flushing into the saltmarsh

5.1.2 Climate change: saltmarsh migration in response to sea level rise

Saltmarshes are predicted to be among the most sensitive habitats to rising sea levels. Saltmarshes naturally migrate inland in response to sea level increases; if there are barriers to migration and space is unavailable due to local geomorphology or the presence of human structures/activities, then patches of saltmarsh will shrink or disappear in response to the constraints¹⁸. As such, predictive buffers around saltmarshes are critical in the preservation of these habitats, in that they provide a physical buffer from current impacts of disturbance from surrounding landuses, as well as providing physical space for migration. The size of the buffer zone should be proportional to the intensity of threats and the likely degree of impact.

The area around the Lauderdale Saltmarsh System is one of the few areas in the Derwent Estuary where surrounding landuse density is sufficiently low that the saltmarsh may be able to migrate inland in response to changing sea levels. The scope for this potential migration has been modelled and a relatively small amount of land is required to preserve habitat space for the saltmarsh (Figure 4). Some of this land is already within Council ownership, however the north-eastern and eastern margins in particular extend into private holdings. In these areas the Councils primary method for creating a buffer to the saltmarsh may be land acquisition.

Alternatively, the Council may be able to modify the local planning scheme to extend the Biodiversity Protection Area overlay to cover predicted migration for saltmarsh¹⁹. The corresponding Natural Assets Code could then be made to reflect that some areas not currently occupied by saltmarsh are given priority consideration in development applications due to predicted future migration of the community. This approach is likely to be more cost effective for the Council and less disruptive and constraining to surrounding landowners.

5.1.2.1 Recommendations for saltmarsh migration

- **Management action 6:** Amend local planning scheme to extend Biodiversity Protection Area overlay to cover all areas predicted to be occupied by saltmarsh following sea level rise induced migration – this should include a buffer to protect from disturbance from local landuse.

These amendments will be consistent with the Southern Tasmanian Regional Land Use Strategy (STCA 2011) regional policy:

C 2 Ensure use and development in coastal areas is responsive to effects of climate change including sea level rise, coastal inundation and shoreline recession.

C 2.3 Identify and protect areas that are likely to provide for the landward retreat of coastal habitats at risk from predicted sea-level rise.

Depending on the nature of the amendment, it may be possible to stratify areas in relation to the saltmarsh:

- Current saltmarsh habitat (priority natural values).

¹⁸ Adam, 2002; Saintilan and Rogers, 2013 in Prahalad (2009)

¹⁹ Prahalad et al. (2018b)

- Near future saltmarsh habitat (modelled extent at a future point in time, taking into account predicted movement and migration constraints).
- Long term refugia corridors for saltmarsh²⁰.



Figure 4: Saltmarsh migration pathways identified by Prahalad (2012)

5.1.3 Development pressures and incompatible human use

Due to the relatively delicate balance of ecosystem processes interacting to maintain saltmarshes, they are susceptible to disturbance by developments. Impacts from development

²⁰ See Whitehead (2012)

(including indirect impacts from adjacent landuses) are evident in many saltmarshes in Tasmania. Within the Lauderdale Saltmarsh System, development pressures with past and present impacts evident include: landfilling (e.g. Lauderdale refuse site, which caused the direct loss of a large amount of saltmarsh) and subsequent leachate release, urban and canal development, grazing, trampling (incompatible recreational use), and loss of tidal connectivity due to South Arm causeway creation (Figure 5).

While several of these factors cannot feasibly be remedied (e.g. past urban development), some can be addressed with or will be addressed with specific management recommendations, including local impacts such as grazing and trampling. Although grazing is not currently an issue within the reserve area, it has been reported from adjacent properties that apparently support some saltmarsh habitat and may be an important limitation on climate induced migration of the community due to the extensive negative impacts it can have on saltmarshes (trampling, loss of plant biomass, altered species composition), as well indirect impacts through soil disturbance and siltation of tidal channels²¹. Similarly, trampling is not currently seen as a priority issue within the reserve, but intrusions by vehicles and motorbikes have damaged the saltmarsh in the past and the risk could increase with increased human presence in the area following the passive recreation area development and can have similar detrimental impacts.

5.1.3.1 Recommendations for addressing incompatible human uses

- Assess integrity of reserve boundary and block any undesired access point (e.g. with boulders); monitor (informally) vehicular and other intrusions into the reserve that may damage saltmarsh vegetation – devise and implement appropriate mitigation measures as required (including signs).
- **Management action 7:** Engage with surrounding landowners on the detrimental impacts of grazing saltmarsh habitat and the limits this could have on migration of the community in response to climate change.
- **Management action 8:** Maintain and monitor the integrity of the saltmarsh boundaries to stop trail bikes and 4WD access

5.1.4 Weed infestations

The reserve currently suffers very little from serious weed infestations, with minor amounts of African Boxthorn and widespread species such as Spanish Heath, Sweet Briar and Radiata Pine. The most important vegetation in the reserve, the saltmarsh communities, is at very little risk of serious degradation from weeds in the near future. It is possible however that conditions in the area and general suitability in some habitats may shift towards favouring weed invasion following creation of the passive recreation area (increased nutrients, introduction of propagules, displacement of herbivores, *etc.*). In addition, a small but relatively weedy area has been identified for targeted weed works (Section 6).

5.1.4.1 Recommendations for managing weeds

- **Management action 9:** Complete weed survey and produce a Weed Management Plan.

²¹ Ausden et al. 2005; Andresen et al. 1990; Bakker and Ruyter 1981; Bakker 1985; Berg et al. 1997; Esselink, Fresco and Dijkema 2002; Jensen 1985; Olsen et al. 2011; in Ng (2016).



Figure 5: Relative impacts of detrimental processes on saltmarsh (pink), including lost habitat (striped blue) (from Whitehead 2012)

5.1.5 Restoration of seagrass beds

Due to the connectivity and interdependence of saltmarshes on the broader coastal ecosystem, protecting and restoring adjacent habitat can provide added benefit to the saltmarsh. It is evident that within the past 50 years a crucial component of the broader ecosystem that has become effectively extinct from the local area is seagrass beds within the sub-tidal shallows of Ralphs Bay (Appendix A). In areas where natural re-establishment of seagrass is impeded, supplementary restoration using seagrass propagation and division is a viable alternative with a history of success.

- **Management action 10:** Support a partnership with key stakeholders to develop a seagrass restoration program in Ralphs Bay.

5.2 Conservation Significant Flora

Two species of flora listed as rare or threatened under the Tasmanian Threatened Species Protection Act 1995 (TSPA) or the Commonwealth Environment Protection and Biodiversity Conservation Act 2002 are present within the Lauderdale Saltmarsh System, while others have records very nearby or have been observed in the past within or around the Lauderdale Saltmarsh System.

5.2.1 Existing threatened species (tall blownglass and tuberous seatassel)

Tall blownglass (*Lachnagrostis robusta*) has been found to be relatively common and widespread throughout the succulent saline herbland within the Lauderdale saltmarsh system²²; it occurs across of range of habitat variations and does not have a particularly narrow niche within that system. This suggests that as long as the saltmarsh habitat is maintained the species will continue to persist and proliferate. As such no specific recommendations are required for this species. General recommendations relating to protection of the saltmarsh community (section 5.1) will ensure the presence of suitable habitat remains available to the species.

The distribution of tuberous seatassel (*Ruppia tuberosa*) within the Lauderdale saltmarsh system is strongly associated with tidal connectivity. The lack of tidal movement in Racecourse Flats is evidently reducing the number of suitable water holes for this species and limiting proportional occupation of suitable holes that are present, possibly due to limitations on the dispersal of propagules or the ability to cross pollinate. Beyond the limitations associated with tidal connectivity, threats to this species are effectively the same suite of risks to the saltmarsh in general (e.g. clearance, climate change, etc.). As such no specific recommendations are required for this species. General recommendations relating to protection of the saltmarsh community (section 5.1) will ensure the presence of suitable habitat remains available to the species and the recommendations in relation to restoring tidal connectivity (section 5.1.1) have the capacity to increase habitat availability.

5.2.2 Potential for additional threatened flora species

In addition to maintaining habitat suitability for the existing threatened flora within the Lauderdale saltmarsh system, general recommendations relating to protection of the saltmarsh community (section 5.1) will potentially aid colonisation of the area by other threatened flora found nearby (golden dodder - *Cuscuta tasmanica*, and roundleaf wilsonia - *Wilsonia rotundifolia*); however, the issue of tidal connectivity is seemingly not critical to these species,

²² North Barker (2012 – with 2013 addendum); Prahalad (2012)

based on their occurrence in insulated saltmarsh patches outside the reserve (Appendix A) and at Calverts Lagoon near South Arm.

Increased tidal connectivity to Racecourse Flats could see the restoration of suitable habitat for fennel pondweed (*Stuckenia pectinata*), which has not been recorded in the area of the reserve for several decades.

One of the other species with historical records from the area, the soft peppergrass (*Lepidium hyssopifolium*) is typically found in human modified habitats, generally in the growth-suppression zone around trees. Landscaping within the passive recreation redevelopment of the old tip site will provide an opportunity to reintroduce this species into ornamental or restoration plantings.

5.2.2.1 Recommendations for additional threatened flora species

- **Management action 11:** Include soft peppergrass in plantings within the passive recreation area of the old tip site²³.

5.3 Conservation Significant Fauna

5.3.1 Lepidopterans

Although it is likely each of the threatened species previously reported from the Lauderdale saltmarsh system are still present in the area (based on habitat availability), the records for saltmarsh looper moth are 25 years old, while the chevron looper moth was last reported in 2007 and the chequered blue in 2013. Furthermore, no systematic survey has been undertaken in an attempt to gauge their abundance in the area and their distribution within the saltmarsh system. There is also a limited amount of ecological knowledge of the looper moths in terms of their habitat preferences and food plants at a fine scale, which may hamper targeted management of the site if required.

It is possible to engage professional and citizen scientists to help address these deficiencies. With respect to the latter, educational signs could be placed around the saltmarsh in areas of potential habitat. The signs could encourage observers to photograph what they think might be one of the threatened species and to submit these observations to a database like iNaturalist for verification (which would then see it added to the Natural Values Atlas). Citizen science is likely to be more effective with the chequered blue as it is a daytime flier, whereas the looper moths are active at night and thus may be more effectively targeted by a professional survey with the added aim of collecting detailed ecological data.

As introduced plants, including the African boxthorn can be food plants for adult lepidopterans, some consideration of such habitat value will be useful in weed management and landscape planting.

5.3.1.1 Recommendations for lepidopterans

- **Management action 12:** Undertake systematic survey for threatened lepidopterans, particularly looper moths.
- **Management action 13:** Engage citizens scientists to look for and lodge observations of threatened lepidopterans via signage.

²³ Note this is likely to require permit approval under the TSPA and will require some consideration of optimal propagation methods and likelihood of persistence.

- **Management action 14:** Consider potential for keeping some African boxthorn as a food plant for chequered blues where the presence of the weed won't breach obligations under the Tasmanian *Weed Management Act 1999*.
- **Management action 15:** Include habitat plants for these species in ornamental plantings and revegetation efforts where possible, in particular where plantings are close to viable natural habitat.

5.3.2 Birds²⁴

Long term data from Birdlife Tasmania has shown a decline in abundance of many of the migratory shorebirds within the Derwent Estuary – Pittwater Area (DEPA) (including the Lauderdale Saltmarsh System). A particularly large decline has been evident in the Far Eastern Curlew, which resulted in its threatened status in Australia being increased to critically endangered in 2015²⁵. It has been postulated that the primary reason for decline of shorebirds in DEPA (and Tasmania more broadly) has been loss of habitat within different parts of their international migration routes; however, this is thought to be compounded by local habitat loss or habitat decline. Restoration of East Marsh Lagoon to a functioning component of the broader tidal mudflat system may thus be a way to consolidate habitat availability for resident and migratory shorebirds in the Lauderdale Saltmarsh System.

Sea-level rise will reduce the extent of the northern tidal flats and loss of the adjacent preferred nesting areas due to coastal squeeze and increased exposure of nests to waves²⁶. Some birds will then nest in the less satisfactory Racecourse Flats, which puts non-flying chicks at risk of roadkill when they need to cross back to the tidal flats for foraging. The greater degree of separation to the foraging grounds may result in chicks being left unattended longer, with subsequent risks of exposure and predation. This area can thus be expected to result in poorer breeding success unless this area is restored through increased tidal connectivity²⁷.

Similarly, exceptionally high tides (to a level that may be more frequent with higher sea levels) have in relatively recent times pushed roosting shorebirds onto South Arm Road and put them at risk of road collisions (Pied Oystercatchers in particular are relatively frequent road mortalities there). Restoration of tidal connectivity to Racecourse Flats and East Marsh Lagoon has the capacity to create new roosting niches safe from the road traffic and may moderate the tide surges on the southern side of the road that currently push roosting birds onto the road. In addition, there is potential to create artificial roosting habitat around the East Marsh Lagoon to supplement potential foraging habitat there that currently appears to be under-utilised (Mike Newman pers. comm.), although the lack of use in that area may also be linked to underlying effects of the tidal isolation. Any increased use of Racecourse Flats however (whether it be facilitated directly or a consequence of restored tidal flushing) will require consideration of infrastructure options that will enable flightless shorebird chicks to access the more extensive foraging areas on the other side of the causeway so as to reduce the risk of birds being hit by vehicles.

5.3.2.1 Recommendations for birds

- **Management action 16:** Design and implement a bird monitoring program that builds upon existing data and monitoring by Mike Newman, reflects methods and priorities

²⁴ With reference to Aquenal (2008a, 2008b), Harrison (2008), and Woxvold (2008)

²⁵ Department of the Environment (2015)

²⁶ Whitehead (2012)

²⁷ Whitehead (2012)

of Birdlife Tasmania regional shorebird counts, and utilises power of citizen science for data collection.

- **Management action 17:** Explore options for creation of roosting habitat around East Marsh Lagoon following some restoration of tidal flushing.
- **Management action 18:** Explore infrastructure options for enabling flightless chicks and walking adults to cross the road.

5.3.3 Aquatic mammals

Although facilitating the recovery of whale populations is beyond the scope of this plan, the passive recreation opportunities in the old tip site create an opportunity to tell the history of whales and whaling in the area while overlooking Frederick Henry Bay from a vantage point.

5.3.3.1 Recommendations for aquatic mammals

- **Management action 19:** Include educational signs in passive recreation area detailing broader ecosystem connectivity, whale and whaling history in the area and nearby threatened species such as handfish.

5.3.4 Terrestrial mammals

It is possible to engage citizen scientists to confirm the presence of the eastern barred bandicoot on site and help contribute to an understanding of its distribution and abundance. Educational signs could be placed around areas of potential habitat, encouraging observers to report to the Council or the Natural Values Atlas. If people could photograph animals without disturbing them they could submit observations to a database like iNaturalist for verification (which would then see it added to the Natural Values Atlas). Citizen science is an effective method for the barred bandicoot as it is distinctive and can frequently be seen around dusk and dawn, and occasionally seen during the day.

5.3.4.1 Recommendations for terrestrial mammals

- **Management action 20:** Include educational sign aiding identification of eastern barred bandicoots and encouraging reporting of observations.

6 Old Lauderdale Tip Site - Passive Recreation Plan

The Lauderdale tip site was first developed for that use in 1970. Complaints began to be recorded in the early 1980's, and by 1985 were considered to have been "numerous" by the relevant Departmental officer. Dust and windblown litter were cited as the main cause for complaint, in addition to several complaints about odour.

Government concerns about the lack of leachate containment, inadequate covering of refuse, inadequate drainage, and the use of saltmarsh communities peaked in the early 90s, leading to recommendations to close the tip by 1995. It has since been vacant land with minimal management input.

Although the subsequent time since closure has resulted in some native plants re-colonising the modified land above the old tip face, the area does not contain anything that constitutes a native plant community. It is currently a mix of self-established adaptable natives, like *Rytidosperma* species (wallaby grasses), planted Australian and Tasmanian natives, including local *Eucalyptus* species, ubiquitous herbaceous weeds and pasture grasses (such as cock's foot, *Dactylus glomerata*), and occasional woody weeds. It is not seen as feasible at this time to aim

for restoration of the old tip site to the original saltmarsh community. The area does nonetheless provide a good space for general restoration and revegetation projects that could reflect local woodland communities and provide habitat for native wildlife. In addition, the large areas of open space provide a significant opportunity for Council to develop the space as a public passive recreation area. This concept received significant community support during consultation. Based on the available space and community preferences, the following management actions are proposed to develop the area for community use. The recommendations cover almost all of the community desires, with a minor number of preferences being overlooked due to minimal support, stakeholder opposition, and/or being incompatible with other uses. All actions are contingent on successfully seeking funding.

- **Management action 21:** Design trailhead landscape and signage for reserve with path map and reserve use guide signage. Include adjacent saltmarsh species and threatened species for education.
- **Management action 22:** Design and implement an entrance trailhead design.
- **Management action 23:** Design and construct a sensitively sited boardwalk to act as a saltmarsh interpretation trail.
- **Management action 24:** Design and construct a shared use gravel pad path circuit track with seating.
- **Management action 25:** Design and construct a single-track mountain bike connection track.
- **Management action 26:** Design and construct a carpark using Water Sensitive Urban Design principles over several stages to suit growth in usage.
- **Management action 27:** Design and construct a fenced dog exercise area.
- **Management action 28:** Develop a detailed design for a children's nature play area and family picnic hub.
- **Management action 29:** Create dense revegetation areas using local native species within the nature spaces.
- **Management action 30:** Develop a 9-hole disc golf course on the tip site.
- **Management action 31:** Extend existing wildlife corridors/ shelter belt planting with climate resilient native plants.
- **Management action 32:** Develop a feasibility study for a Wetland Interpretation Centre (similar to Tamar Wetland Interpretation Centre), which should include cultural interpretation panels acknowledging traditional land occupants.
- **Management action 33:** Develop a Bushfire Management Plan for the tip site.



Key:

- 1 Develop Trailhead – trail map + reserve use guide. Landscape with adjacent saltmarsh species + threatened species as education tool.
- 2 Design and create sensitively constructed boardwalk with sculptural thematic interpretation on saltmarsh ecology.
- 3 Shared use trail, gravel surface, no dogs to be allowed. Nominal route shown with strategically located sculptural seats and potential birdhides*
- 4 Construct single track mountain bike connection trails. Indicative routes mapped.
- 5 Formalise carpark with WSUD + setback from saltmarsh extents. Opportunity to stage construction to meet capacity.
- 6 Create fenced dog exercise area. Re-use existing boundary fence line to north where achievable. Nominally 4500m2 to match others in region. Two access points. No tight corners.
- 7 Proposed 9 Hole Disc Golf Course – Nominally 2 ha. min. (unfenced + open to public). Revegetation within (shown indicatively) to create avenues of endemic vegetated screens for courses. Refer to Bald Hill Park – Victoria. www.kingston.vic.gov.au/Places-and-Events/Sport-and-Recreation/Disc-Golf-Bald-Hill-Park
- 8 Construct Toddler + Children's Nature Play + Family Picnic Hub – located in wind sheltered area close to carpark + trailhead. Opportunity for small learning bike circuit.
- 9 Retain native grassland area for recreational open space and native species habitat.
- 10 Nature Space – area to include planted habitat elements including dense shrubbery. Communication of habitat value on intersection with trail network including eastern-barred bandicoot educational artwork.
- 11 Feature saltmarsh outlook point, notional location shown.
- 12 Combination of boardwalk and gravel path to Tangara Trail. Route to be determined to span / avoid low wetland areas.
- 13 Interpretation installation overlooking Saltmarsh and Ralphps Bay to share key theme of the saltmarsh's critical role in the broader ocean eco-system.
- 14 Shelter belts – extend existing vegetation belts and experiment with climate ready species and their provenance.

*Note – Birdlife Tas have noted bird-hides would be under-utilised due to current limited range of birdlife in vicinity

Lauderdale Tip Passive Recreation Concept Plan

South Arm Highway, Lauderdale | Draft For Review



inspiring place



Date 21 / 10 / 2019
Scale 1:2000 @ A3

Lauderdale Tip Passive Recreation Precedents

South Arm Highway, Lauderdale | Draft For Review

PREPARED FOR NORTH BARKER / CLARENCE CITY COUNCIL

Passive Recreation in Clarence

Clarence City Council has an established strategy for passive recreational activities that encourages healthy lifestyles within the community (Community Health and Wellbeing Plan 2013-2018). Key findings from recent community consultation for the Lauderdale Saltmarsh RAP reflected this priority and led to the identification of possible passive recreational uses for the old Lauderdale Tip site and its perimeter threshold to the saltmarsh.

Shared Trails



Two of the top five priorities for passive recreation responses* were for increased walking and bike trails. The nearby Tangara Trail offers evidence of a successful shared-use trail approach locally. The proposal is to continue the shared trail use, via a large site circuit, and link this to the greater Tangara Trail network.

Nature Play + Picnic Hub



A landscaped area for picnics and play appeared frequently in the community responses, becoming one of the top five priorities for passive recreation for the raised tip site.

There is an opportunity to continue Clarence City Council's network of nature inspired playgrounds by providing a small local scaled toddler and children's nature play area along with a 'learn to ride' short bike circuit within close proximity of picnic shelters.



Consolidating these amenities together and siting nearby to the carpark end of the reserve is recommended to enable ease of access to short term use and rationalisation of maintenance.

Disc Golf



Over 25% of respondents put forward a proposal for a nine hole disc golf course on top of the old tip site. The Australian Disc Golf association and its Tasmanian chapter have supported a 'beginner friendly' course here for the south eastern region and have indicated a minimal equipment footprint is required for the sport.* Bald Hill Park in Victoria demonstrates a similar condition where the course is played amongst native vegetation.

Whilst no fences are required for the playing area, other recreational pathways / activities may need to be spatially separated from the main course.



*Refer to 2019 Lauderdale Tip community 'have your say' submission summary.
** Refer to above submission responses + ADG letter 4/02/2019.

Lauderdale Tip Passive Recreation Precedents

South Arm Highway, Lauderdale | Draft For Review

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Wetlands Raised Walk + Education



A large proportion of responses asked for a raised platform or boardwalk to experience the saltmarsh with minimal impact. Many of these submissions asked for education and interpretation of this sensitive ecosystem to be incorporated.

Tamar Island wetland walk provides a Tasmanian example of raised walkway + educational experience highlighting the critical importance of a healthy wetland system with minimal disturbance. A lightweight, smaller scaled link is proposed for the Lauderdale Saltmarsh site with a series of wider bays and a feature outlook point.



An embedded thematic interpretation strategy is recommended to encourage artful and targeted communication of key messages. Sculptural story seats from the Three Capes Trail demonstrate a study of the intended audience and a play with media to ensure a memorable narrative.

Mountain Bike Single Track Section



Several respondents expressed a desire for separate mountain bike trails. Considering the nearby South-Arm & Meehan Range mountain bike networks this site may only need to offer a small introductory course allowing families to complete a short loop in combination with the proposed shared trail circuit to reduce impact of overall track duplication.

Dog Exercise Area



Close to 10% of submissions asked for a separated dog exercise area within the reserve as there are few in Lauderdale that offer year round safe off-leash spaces. If an area was to be reserved for this purpose it is recommended it be fully fenced, with two exit points and located close to the carpark end of the reserve yet separated spatially from both the Picnic Hub & proposed Disc Golf zone to avoid conflicts between different user groups. It is important to ensure its final location is directed away from existing native fauna burrows / nests.

Climate Resilient Revegetation



The raised tip site soil is predominately a deep clay-based cap and along with the dry, exposed conditions it requires resilient species to revegetate. There is an opportunity to continue the Council's approach of selecting robust native species and to further this with input from University of Tasmania's climate provenance trial projects from the midlands of Tasmania.

7 List of Recommended Management Actions

Note: where the relevant community response theme is in parentheses, the management action is indirectly related; where stakeholder initials are bolded, the action is a high priority.

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
Risk mitigation in preparation for reinstatement of tidal flushing								
1	Low	Conduct feasibility study for the installation of a bund around base of landfill to prevent runoff and protect from infiltration of tidal water (note this action is contingent upon the need being identified by actions 2 and 3 and the restoration of full tidal flushing [action 4] - in other scenarios it would not be necessary).	Bund installed prior to implementing action 4, but only if justified by actions 2 and 3 and the feasibility assessment	Council to engage engineers (EPA may establish role in monitoring water)	Expected 10s of thousands (requires scoping from engineers)	2027	(Q1) (T1)	MN KR PWS
2	Mod.	Implement water testing program, covering surface water, ground water, and the hydrology associated with leachates from the old tip, as well as procedures and redistribution program for	Water testing plan devised and initiated prior to installation of bund	Council to engage environmental scientists and collaborate with	\$3,000 start up, with potential annual costs of \$1,500	2020	(Q1) (T1)	DEP UTAS MN KR EW

²⁸ High, moderate (mod.), low: derived from consideration of community and stakeholder feedback, and consideration of benefits evident from literature review and consideration of costing (i.e. value for money and effort)

²⁹ Stakeholder initials: DEP (Inger Visby, Derwent Estuary Program), UTAS (Vishnu Prahalad), EW (Eric Woehler, Birdlife Tasmania), MN (Mike Newman, Birdlife Tasmania), SH (Susan Hovington, Lauderdale Coastcare), DSG (Tim Leaman and Mia Potter, Department of State Growth), KR (Karen Richards, Threatened Species Section, DPIWE), PWS (Matt Lindus and Rowena Hannaford, Tasmania Parks and Wildlife), JB (Justin Burgess, Clarence Council, Natural Asset Management)

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
		any water trapped by the bund if action 1 is implemented.		DEP in regard to existing regional water testing				SH PWS
3	Mod.	A survey of Potential Acid Sulphate Soils should be undertaken on site to accurately quantify the oxidation and acid potential.	PASS survey completed	Council to engage soil scientists	\$2,500	2020	(Q1) (T1)	DEP UTAS MN KR SH PWS
Reinstatement of tidal flushing across South Arm Road								
4	Moderate	Develop a work plan and seek funding to reinstate tidal connectivity with four 450 mm pipes or a 900 mm x 600 mm box culvert. (Includes a suite of necessary assessments and monitoring projects.)	Work plan developed and funding secured New drains/culvert installed, and relevant monitoring programs commenced	Council to engage consultants/ engineers	\$120,000 (based on previous estimate) – requires revision prior to commencement	2029 Timing of works must not overlap with shorebird breeding season (Sep – Mar)	Q1, T1, X1, Y1	DEP UTAS MN KR EW SH DSG
5	High	If the drain upgrades cannot be achieved (or as an interim solution), implement maintenance regime to regularly remove blockages from all three existing drains.	Regular maintenance program commenced	Maintenance department or contractors of Department of State Growth (DSG), or Council with	\$10,000 per annum	Twice yearly (but frequency needs to be determined by	Q1, T1, X1, Y1	DEP UTAS MN DSG KR EW SH

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
				authority of DSG and Parks and Wildlife		accumulation of silt) Timing must not overlap with shorebird breeding season (Sep – Mar)		
Protecting future of saltmarsh vegetation and broader ecosystem complex								
6	Low	Amend local planning scheme to extend Biodiversity Protection Area overlay to cover all areas predicted to be occupied by saltmarsh following sea level rise induced migration – this should include a buffer to protect from disturbance from local landuse.	Planning scheme amended at next available opportunity	Council to address through planning scheme process	-	2029	F2	DEP UTAS MN KR EW SH
7	Low	Engage with surrounding landowners on the detrimental impacts of grazing saltmarsh habitat and the limits this could have on migration of the community in response to climate change.	Landowners managing adjacent areas to allow saltmarsh migration and persistence, and these areas secured under a covenant	Council	-	2029	A2, F2	DEP UTAS MN KR EW SH

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
8	Low	Assess integrity of reserve boundary and block any undesired access point (e.g. with boulders); monitor (informally) vehicular and other intrusions into the reserve that may damage saltmarsh vegetation – devise and implement appropriate mitigation measures as required (including signs).	Boundary integrity assessed and remediated (if required) Mitigation measures applied as problems arise	Council	-	Ongoing	-	DEP UTAS MN KR EW SH PWS
9	Moderate	Complete weed survey and produce a Weed Management Plan.	Weed Management Plan completed with costed action plan	Council to engage consultant with works completed by natural assets department	\$3,500	2024	-	DEP UTAS SH PWS JB
10	Low	Devise and implement seagrass restoration/reintroduction program within Ralphs Bay sub-tidal areas.	Seagrass restoration program devised and commenced	Council to engage specialists in conjunction with community group assistance	\$20,000	2025	Z1, E2	PWS DEP UTAS MN EW SH
Conservation significant flora								
11	Low	Include soft peppergrass in plantings within the passive recreation area of the old tip site	Viable sub-population maintained on site for greater than	Council to engage landscapers or delegate to	\$3,000	2024	S1	DEP UTAS KR SH

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
			one generation of plants (e.g. seedling establishment evident post first generation plantings)	community group				
Conservation significant fauna								
12	Moderate	Undertake systematic survey for threatened lepidopterans, particularly looper moths.	Updated occurrence and distribution data, as well as habitat assessment for threatened lepidopterans	Council to engage consultant	\$3,000 - \$6,000	2027 (survey timing alignment with species)	R1, U1	DEP UTAS KR EW SH
13	Low	Engage citizens scientists to look for and lodge observations of threatened lepidopterans via signage.	Updated occurrence and distribution data for threatened lepidopterans	Council to install signs	\$1,500	2022	M2, R1, U1	DEP UTAS KR EW SH
14	Low	Consider potential for keeping some African boxthorn as a food plant for chequered blues where the presence of the weed won't breach obligations under the Tasmanian <i>Weed Management Act 1999</i> .	Consideration given in Weed Management Plan	Council, consultant or contractor	(included in WMP)	Refer to WMP (action 9)	R1, U1	DEP UTAS KR SH

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
15	Low	Include habitat plants for these species in ornamental plantings and revegetation efforts where possible, in particular where plantings are close to viable natural habitat.	Improved habitat availability for threatened lepidopterans	Council to engage landscapers or delegate to community group	\$500 (within general landscaping costs)	2024	R1, S1, U1	DEP UTAS KR EW SH
16	Moderate	Design and implement a bird monitoring program that builds upon existing data and monitoring by Mike Newman, reflects methods and priorities of Birdlife Tasmania regional shorebird counts, and utilises power of citizen science for data collection.	Program devised and monitoring commenced	Council to collaborate with Birdlife Tasmania and UTAS	\$1500 start-up and \$500 per annum	2021	R1, U1	DEP UTAS MN KR EW SH PWS
17	Moderate	Explore options for creation of roosting habitat around East Marsh Lagoon following some restoration of tidal flushing.	Investigation undertaken post tidal reconnection, and roosts installed if warranted	Council to engage consultants	\$4,000 (investigation and scoping only)	2027	R1, U1	DEP UTAS MN KR EW SH
18	Moderate	Explore infrastructure options for enabling flightless chicks and walking adults to cross the road including installation of signs to raise awareness of the birds	Investigation undertaken and mitigation strategy proposed	Council to engage consultant	\$2,500	2028 Signs 2020	R1, U1	DEP UTAS MN KR EW PWS DSG

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
19	Low	Include educational signs in passive recreation area detailing broader ecosystem connectivity, whale and whaling history in the area and nearby threatened species such as handfish.	Signs installed and maintained	Council	\$1500	2025	M2	DEP UTAS KR EW
20	Low	Include educational sign aiding identification of eastern barred bandicoots and encouraging reporting of observations.	Signs installed and maintained	Council	\$500	2025	M2	DEP UTAS KR EW SH
Conversion of disused tip site to passive recreation area								
21	Moderate	Design trailhead landscape and signage for reserve with path map and reserve use guide signage. Include adjacent saltmarsh species and threatened species for education.	Landscaping concept + sign design prepared	Council to engage consultant.	Separate costing required.	2023	E1, B2, H2, M2	
22	Moderate	Design and implement an entrance trailhead design.	Trailhead landscaped + signs installed and maintained	Council or contractor.	Separate costing required.	2024	E1, B2, H2, M2	
23	Moderate	Design and construct a sensitively sited boardwalk to act as a saltmarsh interpretation trail.	Boardwalk engineered and installed with maintenance programme	Council to engage consultant + contractor	Separate costing required.	2024	J1	DEP UTAS

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
24	Moderate	Design and construct a shared use gravel pad path circuit track with seating.	Path constructed + maintained	Council	Separate costing required.	2023	A1, G1	
25	Low	Design and construct a single-track mountain bike connection track.	Trail constructed + maintained	Council or contractor	Separate costing required.	2025	C1	
26	Moderate	Design and construct a carpark using Water Sensitive Urban Design principles over several stages to suit growth in usage.	Enough parking bays formalised to suit demand	Council or contractor	Separate costing required.	2025	-	
27	Low	Design and construct a fenced dog exercise area.	Fence constructed + retains dogs appropriately	Council	Separate costing required.	2026	I1	
28	Moderate	Develop a detailed design for a children's nature play area and family picnic hub.	Hub constructed and maintained	Council to engage consultant + contractor	Separate costing required.	2025	F1	
29	Moderate	Create dense revegetation areas using local native species within the nature spaces.	Vegetation planted + maintained	Council	Separate costing required.	2023	R1, S1, V1, W1	SH, JB
30	High	Design and construct a 9-hole disc golf course.	Concept plan prepared; Course installed + maintained	Council to engage consultant, Disc	Separate costing required.	2025	B1, H1	

#	Priority ²⁸	Action	Performance measure	Responsibility	Estimated funding	Timing	Relevant community response theme	Stakeholder priority ²⁹
				Golf Tasmania consulted				
31	Low	Extend existing wildlife corridors/ shelter belt planting with climate resilient native plants.	Vegetation planted + maintained	Council or delegate to community group	Separate costing required.	2026	R1, S1, V1, W1	KR, SH, JB
32	Moderate	Develop a feasibility study for a Wetland Interpretation Centre (similar to Tamar Wetland Interpretation Centre), which should include cultural interpretation panels acknowledging traditional land occupants.	Feasibility study completed	Council	Separate costing required.	2023	M2, N2, O2,	UTAS
33	Moderate	Develop a Bushfire Hazard Management Plan and Ecological Burning Plan to both enhance the biodiversity values within the area and protect users and assets from fire risk (incorporate the prescriptions of this plan with an existing plan for the Lauderdale Wetland Reserve).	Plans completed	Council to engage consultant	Separate costing required.	2022	-	

Appendix A – Review - Natural Values within the Reserve

The Lauderdale Saltmarsh System has been identified as one of the six major environmental assets within the Lauderdale area³⁰. The saltmarsh system makes a key contribution to ecosystem services in the area, includes threatened vegetation communities, supports threatened plant species, provides habitat for threatened and migratory fauna, and has a future role in buffering the impacts from a warmer climate. The saltmarsh is however just one component of a larger coastal ecosystem complex that includes tidal sandflats, dune systems, coastal woodlands, seagrass habitat, rocky outcrops, and fully aquatic ecosystems such as reefs³¹ – the network of habitats that form this ecosystem complex have a high degree of interdependence and the management of single components in isolation is less effective than managing the system as a whole.

A.1 Habitat types

A.1.1 Saltmarsh Vegetation Communities

Tasmanian saltmarshes include relatively unique species assemblages which differentiate them from mainland habitat types³². Saltmarshes in Tasmania do however form part of the nationally vulnerable ecological community: subtropical and temperate coastal saltmarsh³³. At a local level, components of this ecological community are generally mapped within TASVEG mapping units or according to floristic dominance. With respect to TASVEG units³⁴, the Lauderdale Saltmarsh System is dominated by succulent saline herbland (ASS TASVEG unit) (Figure 6). The 70 ha of ASS present around Racecourse Flats is the most extensive area of this unit within the Derwent Estuary and comprises over 75 % of its type within the region.

At a species/floristic level, a survey of the Lauderdale Saltmarsh System documented that Racecourse Flats is dominated by the saltmarsh species *S. blackiana*, *Disphyma crassifolium* and *Spergularia* spp. (Figure 7), all indicators of dry environments and thus strongly indicative of the lack of tidal connectivity to the site³⁵. The same survey reported that the vegetation within the Dorans Road saltmarsh was dominated by *S. quinqueflora*, *T. arbuscula*, and *Samolus repens*, indicative of a typical saltmarsh open to tidal mixing³⁶ (Figure 8). In addition, the disproportionate dominance of dry land species around Racecourse Flats has been documented to respond positively (increase) over short time frames in response to relatively low rainfall years³⁷; this suggests that climate change may further exacerbate the effects of altered tidal connectivity if rainfall reduces, and that this effect may ratchet up over time disproportionately. The increasing shift to relatively dry saltmarsh communities will benefit the threatened grass *Lachnagrostis robusta*, but further disadvantage the aquatic *Ruppia tuberosa*, which is considered to be of greater conservation significance based on fewer records and a more vulnerable ecological niche.

³⁰ Whitehead (2012)

³¹ Whitehead (2012)

³² Prahalad (2012), (2009)

³³ DSEWPAC (2013)

³⁴ North Barker Ecosystem Services (2009), (2008)

³⁵ Prahalad (2012)

³⁶ Prahalad (2012)

³⁷ Ng (2016)

As well as being part of a threatened ecological community, the Lauderdale saltmarsh vegetation provides a diverse range of ecosystem services³⁸:

- Habitat for threatened flora and fauna.
- Carbon capture.
 - Saltmarshes capture carbon, but have very low methane emissions, and are thus considered to be one of the most valuable habitat types for storing greenhouse gases.
- Nutrient and carbon cycling that contribute to tidal flat food webs in areas where there is tidal connectivity.
- Water filtering (from nearby catchment areas).
- Coastal protection from erosion wave activity.

A.1.2 Tidal Flats

The Ralph's Bay tidal flats are the primary habitat for shorebirds within the broader ecosystem complex including the Lauderdale Saltmarsh System (section A.3). The tidal flats that abut the Dorans Road saltmarsh result from a combination of wind, wave processes and tidal activity, which maintain the sediment supply and geomorphic balance for their persistence. The sediments are derived from:

- Erosion (including from wind) and runoff from the local catchment and surrounding coastal features;
- Deposition from the River Derwent (thus derived from erosional processes in the Derwent catchment and coastline); and
- Localised redistributions (including of sub-tidal marine sediments) due to water current and waves.

Those parts of the tidal flat system closest to Dorans Road are less impacted by wind processes than the flats to the north and instead more influenced/reliant on tidal movements (Figure 9). Within the study area, East Marsh Lagoon historically was influenced in the same way as the flats adjacent to Dorans Road and thus would have been equivalent habitat. The causeway has however isolated this area from the required tidal movements to maintain the mudflats and is thought to have contributed to its lesser habitat value.

The Ralphs Bay tidal flats and adjacent shoreline provide a diverse range of ecosystem services³⁹:

- The tidal flats are important for nutrient cycling and in particular denitrification.
- The tidal flats provide habitat for commercial and recreationally targeted fish species (e.g. flounder).
- There are a range of shorebirds using the area for nesting, roosting and feeding.

³⁸ Whitehead (2012)

³⁹ Whitehead (2012)

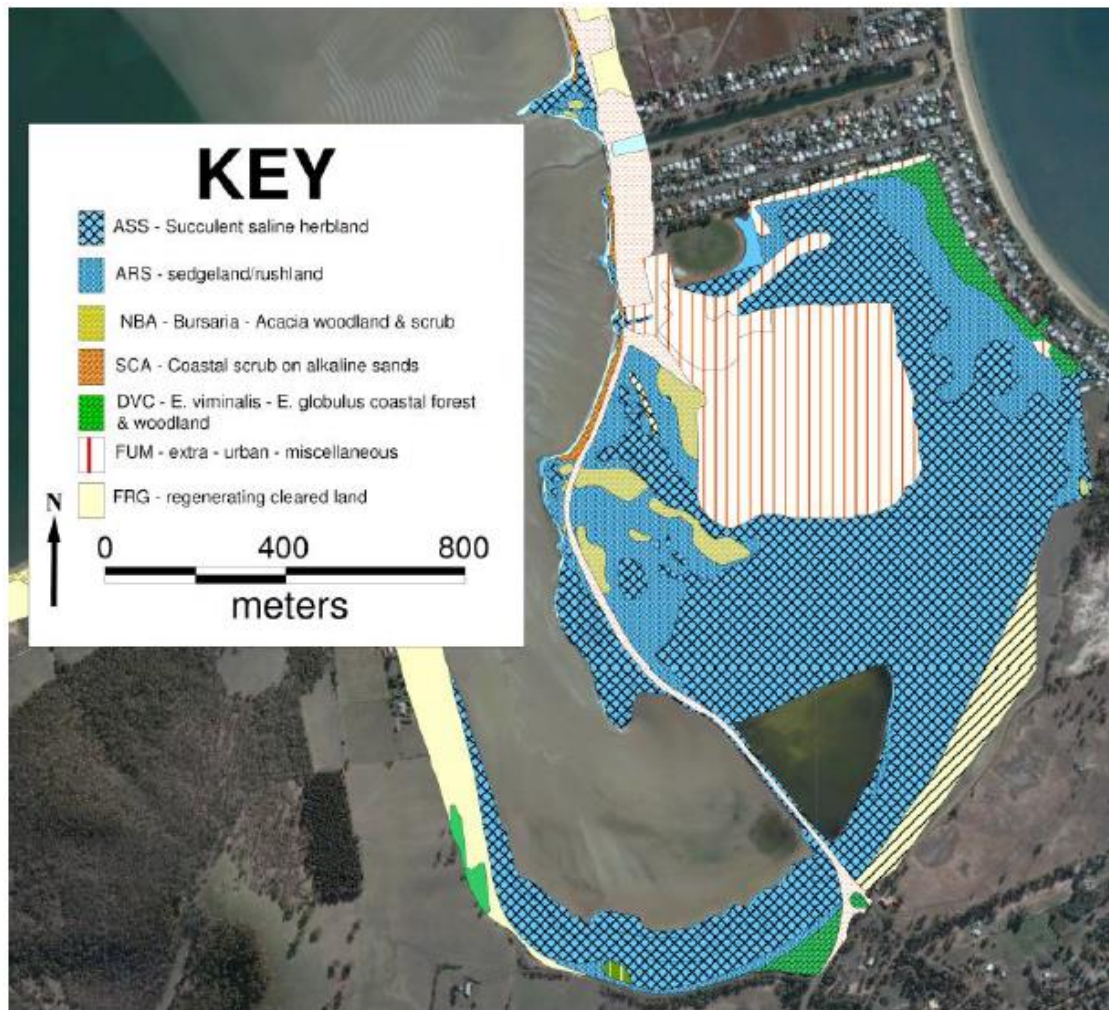


Figure 6: TASVEG units within Lauderdale Saltmarsh System (NBES 2009)

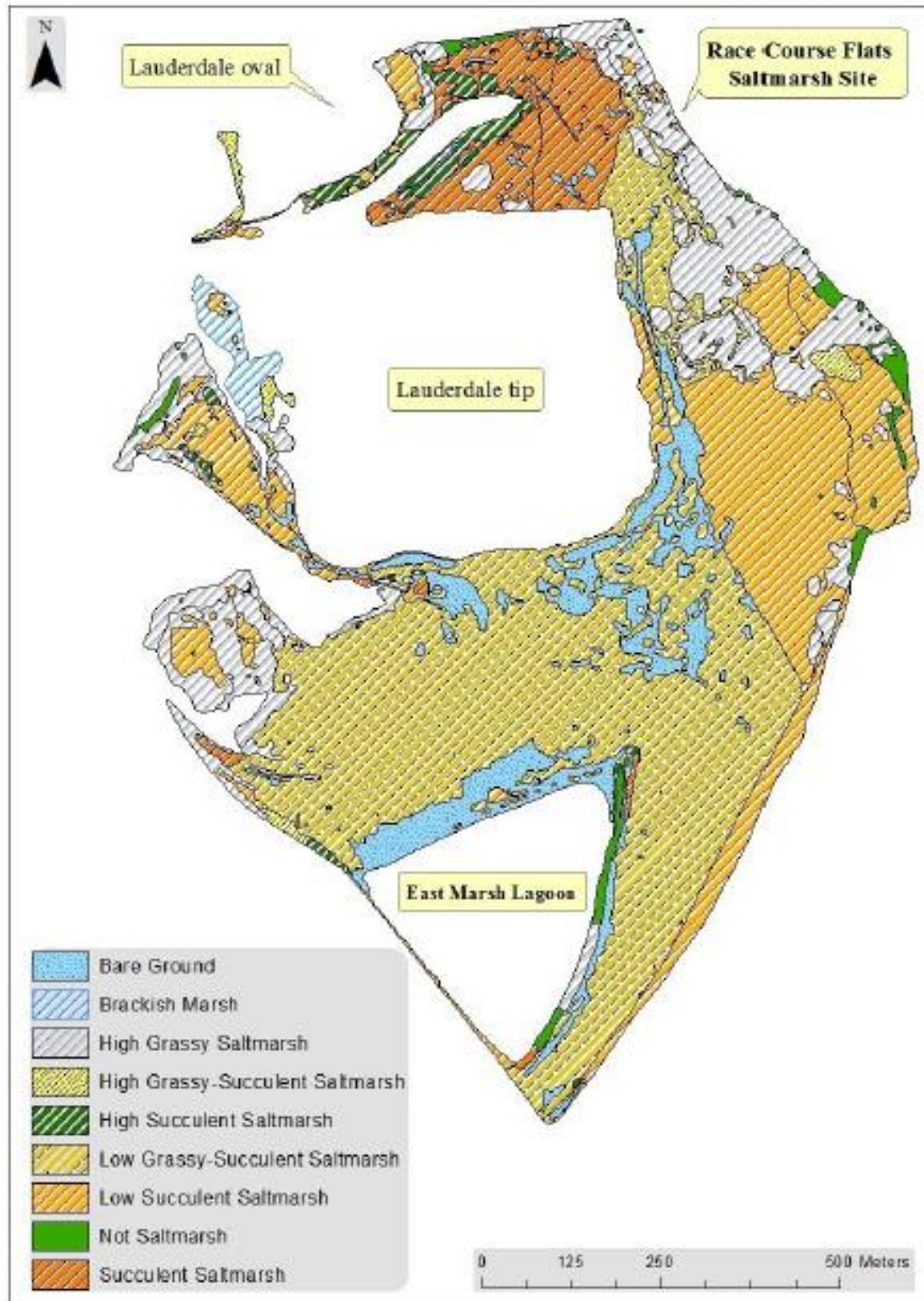


Figure 7: Floristic vegetation communities within Racecourse Flats area (Prahalad 2012)

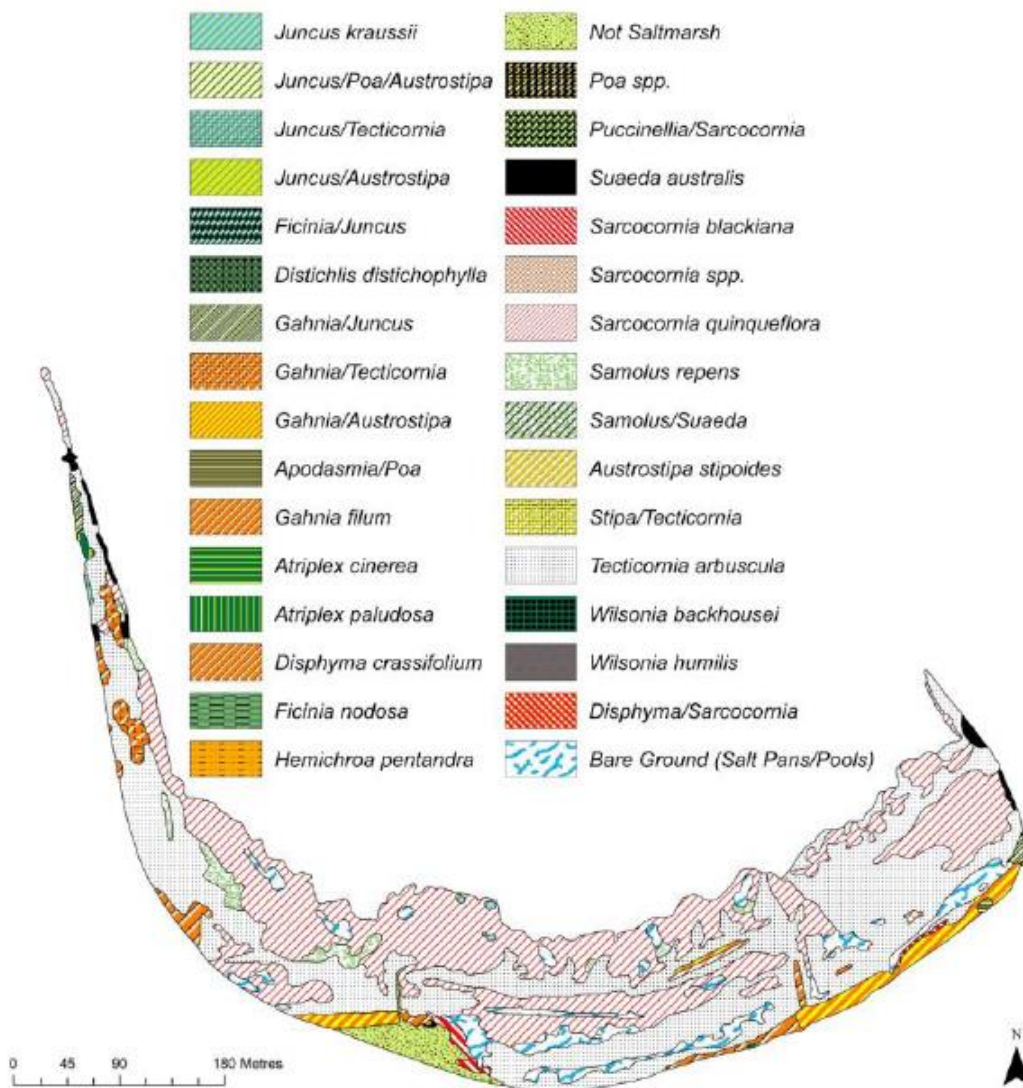


Figure 8: Floristic vegetation communities within Dorans Road saltmarsh area (Prahalad 2012)

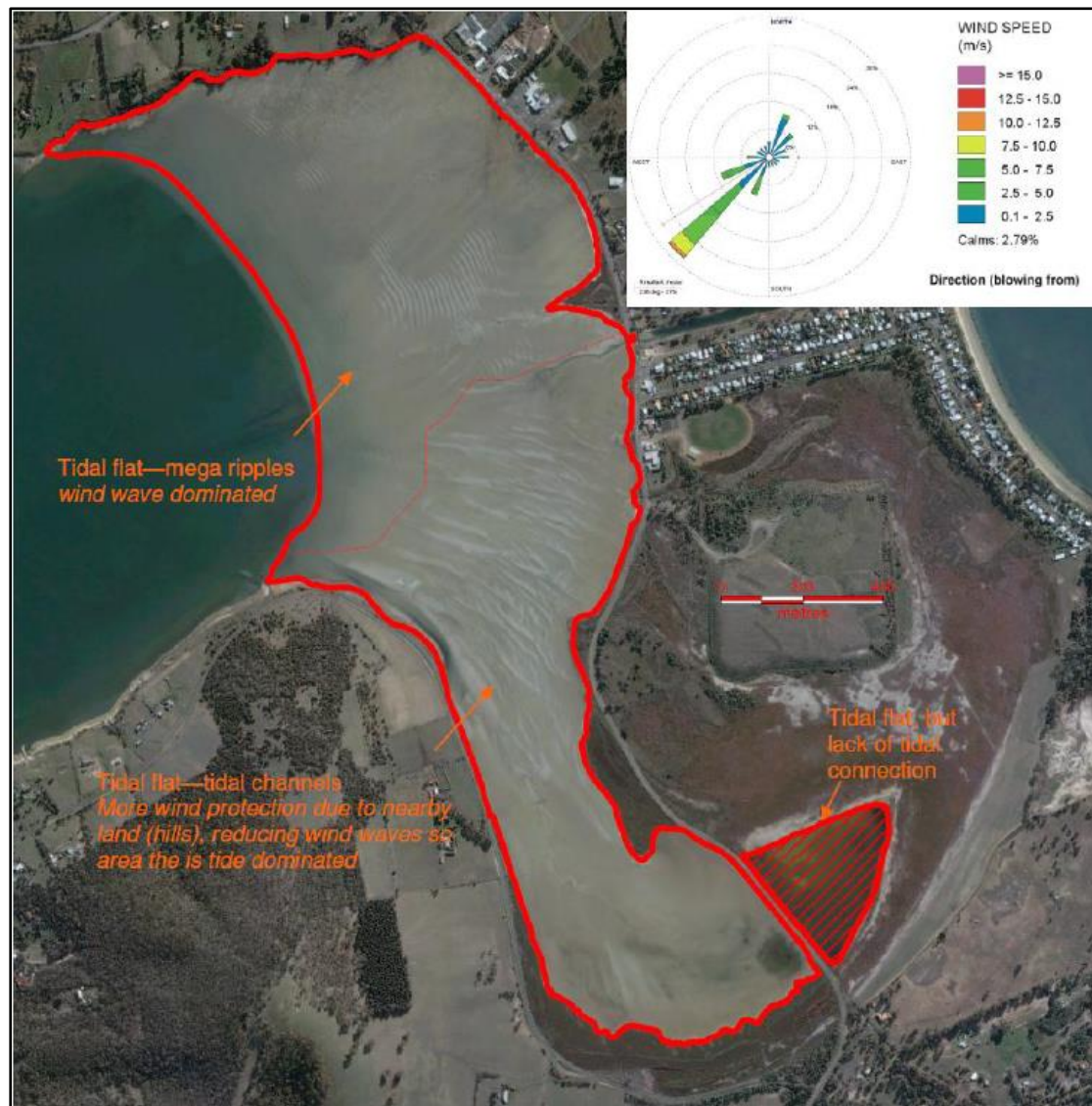


Figure 9: Relative wind effects on tidal flats within the broader ecosystem complex (Whitehead 2012)

A.1.3 Lost Seagrass Beds

A potentially critical habitat type within the Lauderdale Saltmarsh System would have been the subtidal seagrass beds within Ralphs Bay. Seagrass ecosystems provide a suite of ecosystem services⁴⁰, including:

- Nutrient cycling and enhanced denitrification
- Carbon capture and storage
- Habitat for other species, in particular nursery habitat for small fish
- Storm surge protection via sediment consolidation

The decline of the seagrass beds was documented in Ralphs Bay from the 1970s in relation to water quality changes associated with the use of the landfill site⁴¹. Extensive seagrass beds have not been present in the area since and the species that might have dominated these communities remain very sparse⁴² even in the areas of unimpeded tidal connectivity and with water quality capable of maintaining viable seagrass habitat⁴³. The continued absence of the community within Ralphs Bay is thus suggestive of limits to propagule dispersal and reestablishment, rather than a broader prevailing environmental influence. This is consistent with the persistence of other seagrass beds nearby in Lauderdale, beyond the past influences of the landfill leachates⁴⁴.

In areas where natural re-establishment of seagrass is impeded, supplementary restoration using seagrass propagation and division is a viable alternative with a history of success⁴⁵.

A.2 General Flora

The Lauderdale Saltmarsh System is considered to be regionally significant based on containing the highest vegetation diversity across its profile from the seaward to landward edge in comparison with other saltmarshes in the Derwent Estuary – Pittwater Area⁴⁶. Surveys have determined dominant species north of South Arm Road are those typical of relatively dry saline ecosystems, including *Sarcocornia blackiana* and *Disphyma crassifolium*⁴⁷. The assemblage of species in that area (Racecourse Flats) is evidently strongly influenced by the limited tidal connectivity on that side of the road. In contrast, vegetation in the Dorans Road saltmarsh has been found to be dominated by *Sarcocornia quinqueflora*, *Tecticornia arbuscula*, and *Samolus repens*, which are associated with sites open to tidal flushing⁴⁸.

A.3 Conservation Significant Flora

According to accepted records on the Tasmanian Natural Values Atlas (NVA)⁴⁹ and specimens within the Tasmanian Herbarium⁵⁰, two species of flora listed as rare or threatened under the Tasmanian *Threatened Species Protection Act* 1995 (TSPA) or the Commonwealth *Environment*

⁴⁰ References in Whitehead (2012)

⁴¹ Rees (1994)

⁴² NBES pers obs. – unpublished data

⁴³ Whitehead (2012)

⁴⁴ Whitehead (2012)

⁴⁵ Calumpong and Fonseca (2001)

⁴⁶ Prahalad (2012); Whitehead (2012)

⁴⁷ Prahalad (2012)

⁴⁸ Prahalad (2012)

⁴⁹ As of 21/5/2019

⁵⁰ Searched via the Australian Virtual Herbarium (AVH) on 21/5/2019

Protection and Biodiversity Conservation Act 2002 have been observed relatively recently (since the year 2000) within the Lauderdale Saltmarsh System⁵¹ (Figure 10):

- *Lachnagrostis robusta*, tall blownglass – TSPA rare
- *Ruppia tuberosa*, tuberous seatassel – TSPA rare

Modern records also indicate that two other threatened species are extant within minor patches of saltmarsh habitat on private land directly adjacent to Racecourse Flats:

- *Cuscuta tasmanica*, golden dodder – TSPA rare⁵²
- *Wilsonia rotundifolia*, roundleaf wilsonia – TSPA rare

In addition, other species of threatened flora have historical records attributed to the Ralphs Bay area but with low spatial accuracy (over 1000 m); those with potentially suitable habitat in the Lauderdale Saltmarsh System include:

- *Limonium australe* var. *australe*, yellow sea-lavender (TSPA rare)
- *Stuckenia pectinata*, fennel pondweed (TSPA rare)

Two other species have records in the local area (either historical or recent), but are more likely to occur in non-saline habitats, including coastal forest remnants and grassy roadside verges:

- *Lepidium hyssopifolium*, soft peppergrass (TSPA and EPBCA endangered) – not recorded since the 1930s
- *Vittadinia muelleri*, narrow New Holland daisy (TSPA rare)

A.3.1 Extant Species

A.3.1.1 *Lachnagrostis robusta*, tall blownglass

Lachnagrostis robusta is a clumping grass with erect stems up to 60 cm high and an open panicle. In Tasmania, it is known from marshy, estuarine habitat and moist sandy flats, predominantly around the northeast and on the East Coast. Within the Lauderdale Saltmarsh System, thousands of *Lachnagrostis robusta*⁵³ have been found to be widespread within succulent saline herbland (Figures 10,11 and 12, section A.1), with an area of occupancy in excess of 2 ha⁵⁴.

A.3.1.2 *Ruppia tuberosa*, tuberous seatassel

Ruppia tuberosa is an annual or short-lived perennial aquatic herb. In Tasmania the species has been recorded from the State's southeast at Ralphs Bay, Blackman Bay and Marion Bay, where it occurs in inundated holes and channels in salt marsh⁵⁵. The species was rediscovered in the Lauderdale Saltmarsh System in 2016 surveys by Threatened Plants Tasmania (Figure 13). It was found to be one of the dominant species within tidal holes around the Dorans Road saltmarsh area, but largely lacking on the other side of South Arm Road; the extent of potential habitat is both less prevalent on this side of the road and occupied proportionally less by this species where present.

⁵¹ Note that NBES have been involved with the redeterminations of some records previously reported from the area, including the redetermination of *Lachnagrostis punicea* ssp. *filifolia* to *L. robusta*, and *Cotula vulgaris* var. *australasica* to *C. coronopifolia*

⁵² This species was observed in Racecourse Flats in the 70s but has not been recorded since

⁵³ It should be noted that *Lachnagrostis* have a complex taxonomy and collections from this area have in the past been difficult to define with the parameters of a single taxon

⁵⁴ NBES (2012)

⁵⁵ Curtis and Morris (1994)

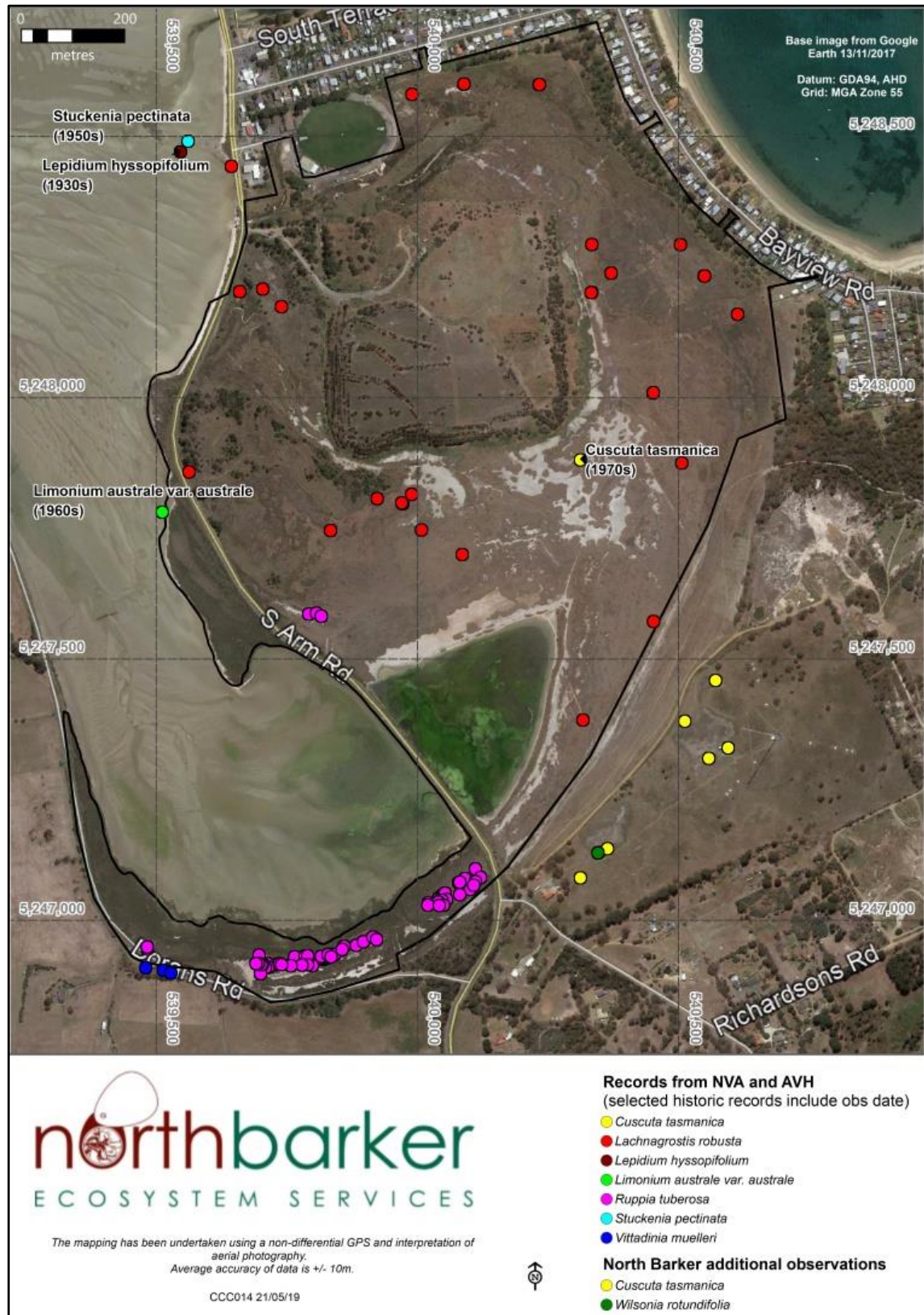


Figure 10: Records of listed threatened flora within the Lauderdale Saltmarsh System



Figure 11: *Lachnagrostis robusta* (tall blownglass) recorded on Racecourse Flats in 2013



Figure 12: Cluster of *Lachnagrostis robusta* (tall blownglass) recorded on Racecourse Flats in 2013

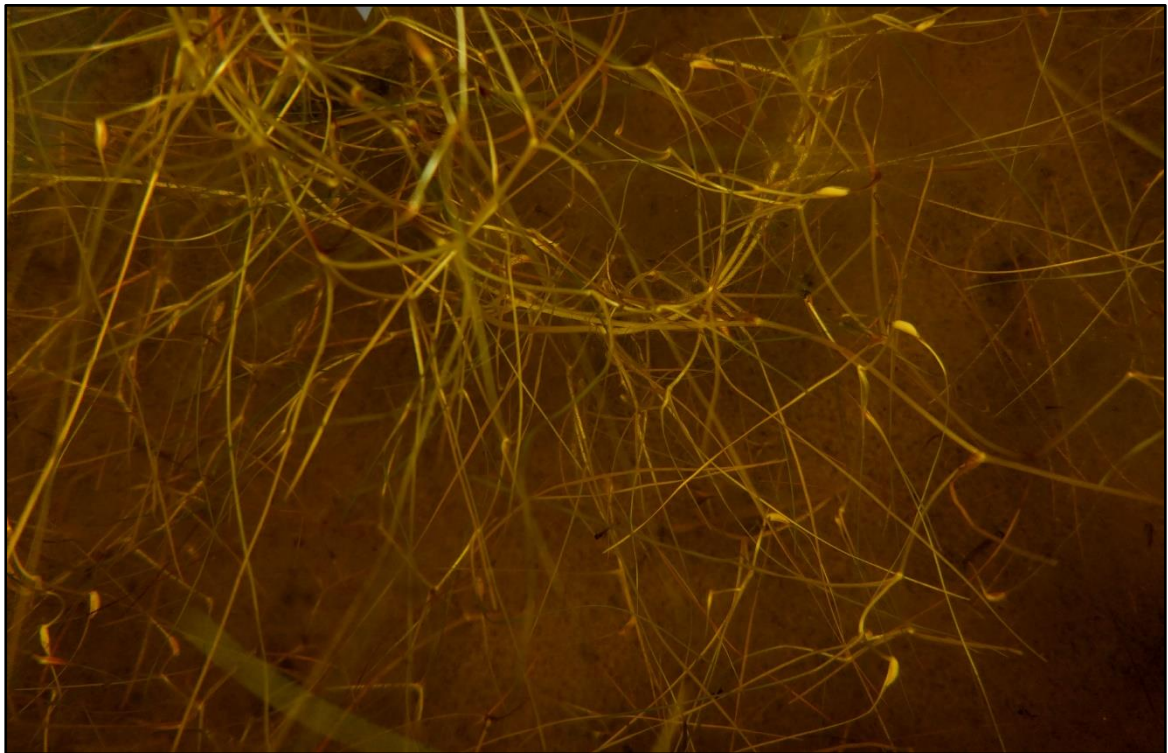


Figure 13: *Ruppia tuberosa* (tuberous seatassel) recorded in Dorans Road saltmarsh in 2016

A.4 Conservation Significant Fauna

The faunal communities associated with saltmarshes are widely known to support a variety of invertebrates, which provide an abundant food source for other fauna, including birds, as well as filling other roles in the ecosystem, such as pollination. The interaction between sources of prey and suitable habitat for young can make tidal areas of saltmarshes important nursery habitats for various aquatic species, particularly fish.

According to accepted records on the Tasmanian Natural Values Atlas (NVA)⁵⁶ and Birdlife Tasmania data, several species of fauna listed as rare, threatened and/or migratory under the Tasmanian *Threatened Species Protection Act* 1995 (TSPA) or the Commonwealth *Environment Protection and Biodiversity Conservation Act* 2002 have been observed relatively recently (since the year 2000) within the Lauderdale Saltmarsh System⁵⁷.

A.4.1 Lepidopterans

Saltmarshes and other types of wetlands are relatively important habitats for lepidopterans (moths and butterflies), due to the abundance of food plants and the presence of species specifically adapted to these habitats. The Lauderdale saltmarsh system has been found to support three TSPA listed lepidopterans:

- *Amelora acontistica*, chevron looper moth – TSPA vulnerable

⁵⁶ As of 21/5/2019

⁵⁷ Note that NBES have been involved with the redeterminations of some records previously reported from the area, including the redetermination of *Lachnagrostis punicea* ssp. *filifolia* to *L. robusta* and *Cotula vulgaris* var. *australasica* to *C. coronopifolia*

- *Dasybela achroa*, saltmarsh looper moth – TSPA vulnerable
- *Theclinesstes serpentata* ssp. *lavara*, chequered blue – TSPA rare

A.4.1.1 Looper moths, *Amelora acontistica* and *Dasybela achroa*

These species are both listed as vulnerable in Tasmania, suspected as having apparently restricted distributions and small populations. Within Tasmania, both species are thought to be restricted to saltmarsh habitat in the Pittwater and Derwent region. There is limited information regarding food plants and habitat of adults and larvae for either species.

A.4.1.2 Chequered blue, *Theclinesstes serpentata* ssp. *lavara*

Although this species is found throughout much of Australia, it is thought to be uncommon in Tasmania and is as such listed as rare under the TSPA. Saltmarshes of the lower Derwent estuary and the associated Pitt Water are likely to represent the core of the species' habitat in Tasmania based on the distribution of records. They occur mainly on saltmarsh, as the larvae feed mainly on the flowering heads and leaves of a saltbush, *Rhagodia candolleana*. Other food plants and habitats are however reported from the mainland⁵⁸, and as *Rhagodia* is more widely distributed in Tasmania than saltmarsh, it is possible the species has a broader niche and distribution than currently understood in the State. Indeed, adults have even been recorded using the flowers of the declared weed African boxthorn (*Lycium ferocissimum*) within the Lauderdale saltmarsh system⁵⁹.

A.4.2 Molluscs

Records on the Tasmanian Natural Values Atlas and from the Tasmanian Museum and Art Gallery indicate that the Lauderdale area, including Roches Beach and Frederick Henry Bay, have records of washed up shells of *Gazameda gunnii* (Gunn's screw shell). Although this species is listed as vulnerable under the TSPA, this is likely to be a product of limited data sharing and survey intensity. TMAG records suggest it is widespread around the north and east of the State in particular. It lives in sand offshore and within subtidal zones, so is generally only recorded as washed up beach shells.

A.4.3 Birds

A.4.3.1 Shorebirds

Saltmarshes and their interconnected systems of mudflats, sub-tidal shallows, seagrass beds, etc., are as an ecological complex recognised as an important feeding, roosting and refuge habitat for resident and migratory shorebirds (waders). The Lauderdale Saltmarsh System is part of a broader ecosystem that provides important habitat for a variety of these species and is recognised as an internationally important bird area⁶⁰. Ralphs Bay tidal flats in particular provide high quality habitat for birds, and as part of the regional habitat complex known as the Derwent Estuary – Pittwater Area (DEPA) (Figure 14) function as habitat for at least eight species of migratory and six resident shorebirds. The Ralphs Bay tidal flats, relative to other parts of the DEPA, appear to be of relatively high importance to migratory double-banded plovers (*Charadrius bicinctus*) and red-necked stints (*Calidris ruficollis*). The Derwent Estuary is internationally significant for resident pied oystercatchers (*Haematopus longirostris*), with at times up to 10 % of the global population foraging on the Ralphs Bay tidal flats⁶¹, which

⁵⁸ Braby (2004)

⁵⁹ McQuillan (2013)

⁶⁰ Dutson et al (2009)

⁶¹ Birdlife Tasmania data

represents one of the largest sub-populations in Australia and the second largest on mainland Tasmania. The red-capped plover (*Charadrius ruficapillus*) is another commonly observed resident shorebird at Ralphs Bay.

Assessments that have extended beyond the current study area⁶² have concluded that the northern tidal flats of Ralphs Bay appear to be the favoured shorebird foraging area amongst local habitats, notably with respect to pied oystercatchers, which nest on the adjacent foreshore, and thus benefit from the good connectivity and line of sight for their flightless chicks between the nesting and foraging areas.

A.4.3.2 Other birds

In relation to land birds, the broader area beyond Mount Mather includes a historical report of a nest site of the white-bellied sea eagle, *Haliaeetus leucogaster* (TSPA vulnerable). Although a nest has not been confirmed in that area since the 1980s (and surrounding landuse has changed markedly since then, in particular in relation to surrounding periurban housing), a participant at the community walk and talk indicated they had observed a suspected breeding pair of eagles in that area. Certainly, both species of eagle in Tasmania are likely to forage in the area from time to time, and the white-bellied sea eagle in particular, may forage around tidal areas.

A.4.4 Mammals

A.4.4.1 Aquatic mammals

Threatened mammals, including southern right whales (*Eubalaena australis*), humpback whales (*Megaptera novaeangliae*) and southern elephant seals (*Mirounga leonina* ssp. *macquariensis*) have to varying degrees been recorded in waters around the Lauderdale area. Whilst records of the latter are considered to be incidental (based on low habitat suitability), the broader area of the Derwent Estuary in Tasmania represents an area infrequently occupied by whales today, but which, from historical accounts, was an important habitat prior to exploitation. In particular, nearby Frederick Henry Bay was a known hotspot for Southern right whales (*Eubalaena australis*) in the past, based on nearby whaling stations established during the whaling era in the early 1800s⁶³. It is thought that historical areas of abundance and the locations of shore-based whaling stations are reliable indicators of important calving and socialising areas for this species. In support of this, this area is now a contemporary calving and socialising area for the species as the population recovers post-whaling (pers. comm. Marine Conservation Program, DPIPW). Extended seasonal residency of southern right whales has been recorded in the broader area during the last ten years (pers. comm. Marine Conservation Program, DPIPW). Extended social aggregations, such have been observed in Frederick Henry Bay in recent years (pers. comm. Marine Conservation Program, DPIPW) may be a precursor to breeding activity. Indeed, Frederick Henry Bay, is highly suitable as a calving and socialising area (a large expanse of shallow, sheltered water with a sandy bottom and gentle bathymetric gradient). Whilst Tasmania is not considered to be part of the (past or present) breeding territory for humpback whales, the species is regularly observed in Frederick Henry Bay during migration periods, including a period of extended winter residency by feeding animals in 2014 and 2017.

⁶² Whitehead (2012)

⁶³ Chamberlain (1988)

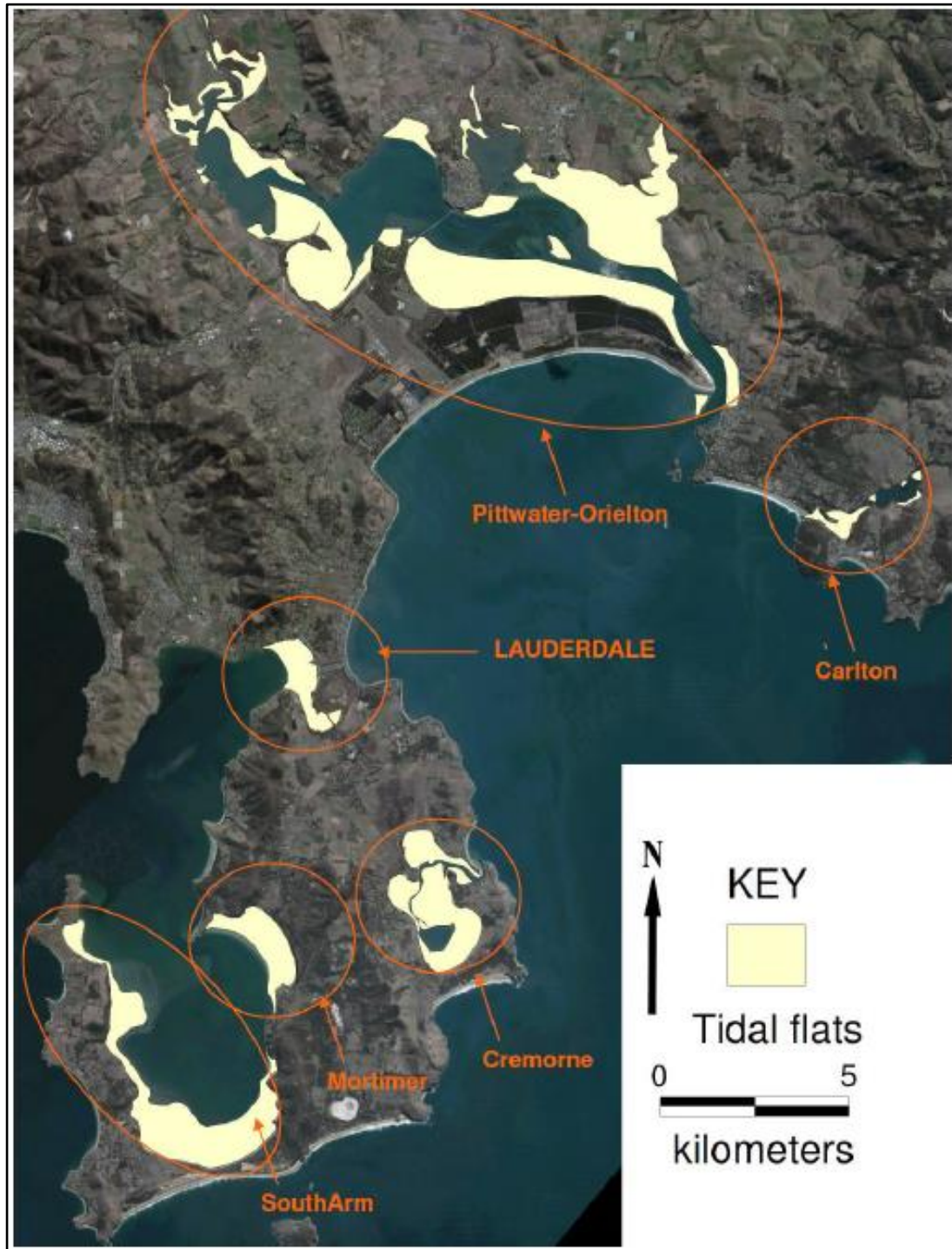


Figure 14: Context of Lauderdale Saltmarsh System within the Derwent Estuary – Pittwater Area

A.4.4.2 Terrestrial species

Eastern barred bandicoots, *Perameles gunnii* (EPCBA vulnerable), are common in surrounding periurban areas⁶⁴, where they forage in relatively open grassy areas at night, and shelter by day in dense clusters of ground level vegetation and debris. Nests are ephemeral grassy accumulations in sheltered spots. The species is a prolific breeder, which enables it to persist in some human-dominated landscapes despite relatively high levels of mortality from roadkill, cats, and harassment from domestic dogs⁶⁵.

Based on the location and the habitat suitability, it is likely eastern barred bandicoots are present within the old tip and surrounding habitats, although there are no confirmed records.

A.5 Ecosystem Services

Saltmarshes as an ecological community provide a range of ecosystem services such as: filtering surface water prior to it entering the sea; carbon sequestration; contribution to coastal productivity; nursery habitat to a variety of aquatic species; provision of food and nutrients for various marine and estuarine inhabitants, including migratory shorebirds; and stabilising the coastline and providing a buffer from waves/storms⁶⁶.

A.5.1 Blue Carbon

'Blue Carbon' is a term applied to the capacity of marine and coastal aquatic ecosystems to trap atmospheric carbon dioxide⁶⁷. Saltmarshes are among the most efficient ecosystems globally at sequestering carbon, although different areas of saltmarsh will vary in capacity⁶⁸. Their proficiency is due to the biogeochemical conditions in tidal wetlands being conducive to long-term carbon retention (although it may be the less frequently inundated areas that store the most carbon, such as *Tecticornia* shrublands⁶⁹). Saltmarshes store carbon by accumulating carbonates (e.g. gypsum, shell grit and calcrete) and by burial of organic matter, preventing oxidation. In addition, methane (a damaging greenhouse gas) emissions are significantly reduced in environments where methanogenic bacteria (which breakdown organic matter) are inhibited by salinity (greater than 30g/L)⁷⁰.

As a result, an important concern with the degradation (including physical damage, and changes in salinity, sea level, or tidal connectivity) or clearance of saltmarsh habitat is that it can lead to large emissions of carbon and methane stored in wetland sediments, either into coastal waters or the atmosphere. Reduction of tidal flows into a saline marsh changes the soil structure, allowing pockets of anaerobia close to the surface, where emissions can occur, while also freshening the soil profile and facilitating the emission of methane.

Although there have been no definitive Australian studies, it is thought that a fully functioning saltmarsh can accumulate up to 3.5t CO₂ per hectare per annum, while tidally restricted marshes could potential emit in the vicinity of 250t CO₂e per hectare per annum, depending on the degree of degradation⁷¹.

⁶⁴ Daniels and Kirkpatrick (2012); Daniels (2011)

⁶⁵ Daniels (2011)

⁶⁶ Morrissey, 1995; Boorman 1999; Mazumder et. al., 2006; Caton et al., 2009; Connolly, 2009; DCC, 2009 in DSEWPAC (2013)

⁶⁷ Nellesmann et al. (2009)

⁶⁸ Pidgeon, 2009; Saintilan and Rogers, 2013 in DSEWPAC (2013)

⁶⁹ Cook (2012)

⁷⁰ Choi and Wang, 2004; Poffenbarger et al., 2011; Saintilan and Rogers, 2013 in DSEWPAC (2013)

⁷¹ DSEWPAC (2013)

A.5.2 Soil Structure and Chemistry

Soil surveys have also established that the profile of Racecourse Flats has been subject to a small amount (5-20 cm) of subsidence (relative to the tidally connected side of the road) since it was isolated. The subsidence is related to several potential factors, including the evident levels of soil decay since it was subjected to restricted tidal activity⁷². A prominent indicator of this decay is the slimy brown to black surface layers at Racecourse Flats, compared to the milk-chocolate brown organic clays at control sites⁷³. Within this decayed soil has been recorded Monosulfidic Black Ooze (MBO), with the resultant conclusion being the site is rich in Potential Acid Sulfate Soils (PASS), which have the capacity to become more acidic if exposure to air continues without a significant carbonate source and may also be contributing to subsidence⁷⁴. The presence of recently activated PASS is supported by the prominent rust-red staining on the soil surface within Racecourse Flats⁷⁵. Given the significant amount of soil structure decay, the area will be increasingly subject to both wind and water erosion, without some form of restoration to improve soil structure. Reflooding of the area with tidal water will improve soil structure in the long term, however it will need to be managed to allow the ecosystem to adapt, reducing erosion during the transition period⁷⁶.

A.5.3 Water Quality and Drainage⁷⁷

The results of previous water testing found that most of the water within the impounded area of Racecourse Flats was in an oxidizing state⁷⁸. The water outside of the tidally restricted area was found to be in the opposite state (a reducing environment). Oxygen content was found to be super-saturated at the base of the old tip site, which suggests that anaerobic conditions could prevail on warm summer nights. In addition, it was posited that water salinity levels could be more variable inside the impoundment than they are outside, due to lower flushing and runoff discharges.

Previous monitoring around the former landfill site has indicated that leachate has the capacity to seeping out into the saltmarsh in particular conditions, with the nutrient ammonia one constituent of the leachate found in high concentration (19 mg/L) in the early 2000s. Although it is thought the leachate is too restricted to impact the marine environment, elevated nutrients from leachate may have caused localised eutrophic areas within Racecourse Flats and East Marsh Lagoon, with excessive surface algal growth, resulting in saltmarsh loss and the formation of bare-ground areas where surface water now ponds after heavy rainfall. Some of these patches are now salt pans, and their white appearance is due to salt formation due to evapotranspiration of the ponded water⁷⁹. A similar scenario has been noted on the northeast of the landfill site, where the change in topography interfered with natural drainage and has contributed to vegetation loss through pooling⁸⁰.

⁷² Cook (2012)

⁷³ Cook (2012)

⁷⁴ Cook (2012)

⁷⁵ Cook (2012)

⁷⁶ Cook (2012)

⁷⁷ Cook (2012)

⁷⁸ Cook (2012)

⁷⁹ Prahalad (2012)

⁸⁰ North Barker (2008)

Appendix B – Community Engagement Process

In April 2019, Council engaged with the local community (via mail) to participate in a community forum ('Walk and Talk') as described below. The provided information outlined the study area (including the map in Figure 1) and project objectives (Section 1.1). All parties were given the opportunity to provide feedback on the RAP process, management concerns, and desired potential outcomes for the area, via return mail or over the internet (options for both email and web submission).

Community engagement information supplied to residents

Council will be developing a Lauderdale Saltmarsh Reserve Activity Plan which will include the old Lauderdale tip site.

The 122 hectare site includes the following locations (see below map):

- Racecourse Flats
- East Marsh Lagoon
- Old Lauderdale Tip site
- Doran's Road Saltmarsh

The process will involve extensive community consultation with the local community, the Lauderdale Coastcare Group and adjoining property owners.

The broad objectives of the reserve activity planning process are to:

- Ensure the reserve is sustainably managed to preserve and enhance its natural, cultural and social values;
- Identify priority management activities to be undertaken within the reserve by Council and/or volunteer groups as resources become available; and
- Encourage community engagement through raising awareness of the reserve's values and encourage participation in activities to minimise threats to these values.

Walk and Talk

You are invited to attend a 'Walk and Talk' to discuss issues of interest and concern with the consultant and council representatives in relation to the reserves marked on the below map.

Date: Sunday 14 April 2019

Time: 2.30pm

Location: Starting at the car park at the entrance to the old Lauderdale tip site accessed off the South Arm Highway.

How to provide your feedback

Interested parties will have several opportunities to engage with the consultant and council as well as comment on the draft reserve activity plan prior to seeking formal council endorsement of the plan. These opportunities include:

- Attending the 'Walk and Talk' session;
- Completing our online feedback form (see below)
- Providing written comments on the draft when it goes on public exhibition; and
- Contacting the consultant from NorthBarker, Grant Daniels, on 0400 104 649 or emailing GDaniels@northbarker.com.au or contacting the project manager Phil Watson pwatson@ccc.tas.gov.au.

This initial consultation process will conclude on Friday 31 May 2019, with the results of the community consultation being collated to guide the development of the draft plan.

Draft Lauderdale Saltmarsh Reserve Activity Plan 2019 - 2029 Feedback Form

Name *

First name

Surname

Address *

Street Address

Suburb

State

Postcode

Email *

Your comments *

Appendix C – Community Response Summary

Response themes (Management comments; desired uses)		Number of respondents (n = 50)	% respondents
Passive recreation			
A1	Desires more walking tracks/maintenance of current track, and linkage to other tracks/areas	15	30
B1	Desires a disc golf course	13	26
C1	Desires/values bike riding opportunities	10	20
D1	Desires bird hides/platforms and boardwalks for bird watching	7	14
E1	Area seen as valuable resource for potential recreation benefits	6	12
F1	Desires landscaped social area (park, gardens, BBQs, picnic facilities, playground, toilets, outdoor gym equipment, etc.)	6	12
G1	Desires seating	5	10
H1	Desires areas/ovals for sports and/or community clubs	4	8
I1	Desires dog park/dog exercise and dog walking opportunities	4	8
J1	Desires viewing platforms/boardwalks (not bird specific) for saltmarsh	4	8
K1	Desires a community food garden with composting facilities	1	2
L1	Desires a maze	1	2
M1	Desires horse-riding track	1	2
N1	Desires meditative areas for reflection	1	2
O1	Desires motorbike track	1	2
P1	Opposed to dogs in the area	1	2
Environmental			

Response themes (Management comments; desired uses)		Number of respondents (n = 50)	% respondents
Q1	Emphasises importance and supportive of tidal flushing for saltmarsh health	14	28
R1	Values area for general biodiversity	8	16
S1	Supportive of/desires planting of vegetation, including trees/arboretum	7	14
T1	Specifically mentioned unblocking drains/engineering changes for saltmarsh flushing, some with reference to perceived responsibility of State Growth	6	12
U1	Values area for its wildlife habitat, particularly birds	6	12
V1	Appreciate Council's ongoing efforts to rehabilitate the tip site/encourage recolonising native plants	4	8
W1	Desires planted wetland habitat and/or other habitat for wildlife	4	8
X1	Acknowledges value of saltmarsh as carbon sink (or carbon source when deteriorating)	3	6
Y1	Appreciates saltmarsh for ecosystem values/role in environmental health	3	6
Z1	Emphasises importance of managing ecosystem as a whole	2	4
A2	Against cattle grazing on the edge of Racecourse Flats	1	2
B2	Desires separation of passive recreation uses from sensitive bird habitats	1	2
C2	Desires remediation of foul water smell	1	2
D2	Doesn't want marshes drained	1	2
E2	Supports re-planting of sea grass beds	1	2
Socio-political			
F2	Against development of area, including due to concerns regarding	4	8

Response themes (Management comments; desired uses)		Number of respondents (n = 50)	% respondents
	wildlife/environmental values, including migration of the saltmarsh		
G2	Supportive of Council's process in developing a RAP for the area	4	8
H2	Values area as public land for community use and opposed to alternative development (residential/industrial)	4	8
I2	Dubious over Council's process in managing projects and the environment; suggest greater community consultation is needed	3	6
J2	Sensitive to past development proposals in the area and supportive of community opposition to developments	3	6
K2	Acknowledges local community and the importance for them to support outcomes of the RAP (mentions they were integral in closing tip)	2	4
L2	Prefers funds were allocated elsewhere	1	2
Education and community			
M2	Desires interpretation/education signage	5	10
N2	Suggests that community should be informed of saltmarsh as an ecosystem (including threatened species and general ecology)	3	6
O2	Sees potential education benefits from the wetland/saltmarsh	2	4
P2	Encourages the creation of a 'Friends of' group to promote values of the area and provide management and monitoring resources	1	2
Access (vehicular)			
Q2	Desires new road connecting southern end of Lauderdale to South Arm Road	1	2
Maintenance			

Response themes (Management comments; desired uses)		Number of respondents (n = 50)	% respondents
R2	Desires repairs to fencing around old tip site	1	2

Appendix D – Community and Submissions Register

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
KB	Email	2/4/2019	<p>A. Sees great potential for wildlife and recreation in the area.</p> <p>B. Referred to example of Lake Pertobe in Victoria as potential ideas for Lauderdale.</p>	<p>A. Several management actions reflect the areas value to wildlife and the potential for recreation.</p> <p>B. This and similar examples were consulted in consideration of plans for the passive recreation area.</p>
IJ	Email	3/4/2019	<p>A. Emphasises education required for community to fully appreciate saltmarsh environment and ecology.</p> <p>B. Suggests Council needs to be sensitive to history of community interactions with development in the area and general environmental impacts.</p>	<p>A. Several education signs will be present in the passive recreation area and community events will continue to be a part of the Councils engagement with local community.</p> <p>B. Extensive community consultation has been undertaken to address this.</p>

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				(Additional specific email responses from Council on 3/4/19)
TK	Email via DEP	3/4/2019	<ul style="list-style-type: none"> A. Suggests that the community has not been consulted sufficiently in the past. B. Questions past management of the area with respect to particular environmental impacts. C. Emphasises need to take high level approach to environmental management, to factor inter-connectivity of ecosystem components. D. Specifies importance of tidal flushing and issue of blocked drains. 	<ul style="list-style-type: none"> A. Extensive community consultation has been undertaken to address this. B. Council have detailed scientific studies of the area to facilitate best practice management. C. The recommended management actions in several cases reflect the connectivity with a broader ecosystem, such as the tidal flats and seagrass beds. D. This has been identified as a high priority management action.
DP	Community feedback form	3/4/2019	<ul style="list-style-type: none"> A. Against more sports ovals. B. Supportive of recreational gardens with BBQ and picnic facilities, extended walking tracks and bird hides. 	<ul style="list-style-type: none"> A. No additional sports ovals have been proposed. B. Tracks, landscaping and picnic facilities are incorporated into the

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
			C. Acknowledges community opposition to local development and value of public land.	passive recreation area; a bird watching hide was not considered to be a high priority by Birdlife Tasmania. C. Extensive community consultation has been undertaken to address this.
LT	Community feedback form	8/4/2019	A. Desire for restoration of saltmarsh function through tidal flushing. B. Values biodiversity of saltmarsh, as well as carbon storage capacity when functioning well.	A. This has been identified as a high priority management action. B. Several management recommendations have taken these factors into account.
C&RD	Community feedback form	4/4/2019	A. Supportive of Council developing RAP for area.	-
M&DG	Community feedback form	4/4/2019	A. Desire for walking and bike riding tracks (the latter should be kept away from bird habitats and viewing areas). B. Suggestion that more vegetation is planted, including wetland habitat. C. Desire more seating and viewing platforms. D. Desire bird hide (with seating).	A. Passive recreation plan includes sensitively placed tracks and saltmarsh outlook points. B. A landscaping plan is included with the passive recreation area concept,

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				<p>however the old landfill site is not very suitable for wetland plantings; restoration of the natural saltmarsh/wetland components within Racecourse Flats is a priority.</p> <p>C. Seating and viewing areas will be available within the passive recreation area.</p> <p>D. A bird watching hide was not considered to be a high priority by Birdlife Tasmania.</p>
TP	Community feedback form	4/4/2019	<p>A. Emphasises importance of area as public recreational space.</p> <p>B. Supportive of bike riding opportunities.</p> <p>C. Desires dog park.</p> <p>D. Desires boardwalk/platforms for bird watching.</p> <p>E. Opposed to residential or industrial development.</p> <p>F. Values ecosystem benefits of site, including values that have recolonised old tip site.</p>	<p>A-D. Incorporated into passive recreation concept.</p> <p>E. Planning measures are recommended to protect future saltmarsh from development.</p> <p>F. These values have been considered extensively in all actions.</p>

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
Anon	Community feedback form	11/4/2019	<ul style="list-style-type: none"> A. Opposed to development of site and wants to see it reserved for public use. B. Supports revegetation of areas and foul water dealt with. C. Desires opportunities for bushwalking, bird watching, and cycling. D. Opposed to dogs in the area. E. Specifically requests cycleway between Lauderdale and Cremorne, alongside South Arm Road. F. Supportive of tidal flushing of saltmarsh and its relationship with habitat value for migratory birds. G. Desires high quality interpretation signs. H. Desires seating areas. 	<ul style="list-style-type: none"> A. No development is being proposed for site. B. Landscaping plans include revegetation opportunities, while the potential for microbial activity resulting in bad odours following reinstatement of tidal connectivity will be monitored. C. The passive recreation plan provides opportunities for these activities. D. A fenced dog exercise area was otherwise supported by the community. E. Beyond the scope of this project. F. This has been identified as a high priority management action. G. Included within passive recreation area. H. Included within passive recreation area.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
MP	Community feedback form	11/4/2019	<ul style="list-style-type: none"> A. Desires a bike park in the area. B. Compares to potential southern equivalent to facilities in Derby, but on the flats. 	Bike riding opportunities included within passive recreation area plan, but a dedicated bike park of the scale alluded to was not considered to be viable in the context of the site and other community desires.
TW	Community feedback form	12/4/2019	<ul style="list-style-type: none"> A. Doesn't want marsh drained into Frederick Henry Bay. B. Preference is for funds to be spent on local streets/roads. C. Requests greater community consultation than previous projects in the area. D. Desires walking track at the south end of the saltmarsh to be maintained. E. Preference is for funds to be allocated on protecting local dunes from erosion/storm surges. 	<ul style="list-style-type: none"> A. Tidal connectivity was overwhelmingly supported and shown to have multiple ecological benefits. B. Our consideration is that funding required for this project is unlikely to compromise spending on other infrastructure and in some cases come from independent sources for specific purposes. C. Extensive community consultation has been undertaken to address this.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				<p>D. This will not be compromised.</p> <p>E. Seen as an independent issue, but in general the proposed restoration of the saltmarsh will be beneficial for storm surge protection on that side of the coast.</p>
RW	Email	14/4/2019	<p>A. Desire for more ways to use the area for walking, running and riding.</p> <p>B. Desire linkage between trails, including those in the existing area.</p> <p>C. Desire for trails that are pram friendly.</p>	<p>A. Passive recreation area will provide this.</p> <p>B. Passive recreation area will provide this.</p> <p>C. To the degree possible, based on practicality, the location and the intended purpose, some trails will have suitable surfacing for prams.</p>
KC	Community feedback form	15/4/2019	A. Desires more running trails.	A. Passive recreation area will provide this.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
CC	Community feedback form	14/4/2019	<ul style="list-style-type: none"> A. Supportive of daily tidal flushing of the saltmarsh. B. Proposes moving South Arm Road. C. Values saltmarsh habitat to migratory birds. 	<ul style="list-style-type: none"> A. This has been identified as a high priority management action. B. Not seen as a viable option at this time. C. Birds will be a priority in any future management of the area.
SB	Community feedback form	16/4/2019	<ul style="list-style-type: none"> A. Supportive of restoring tidal flushing of saltmarsh. B. Supportive of conversion of tip site to a natural site. C. Desires boardwalks and viewing platforms. 	<ul style="list-style-type: none"> A. This has been identified as a high priority management action. B. This will be achieved within the passive recreation plan. C. These are included within the passive recreation plan.
JC	Community feedback form	16/4/2019	<ul style="list-style-type: none"> A. Emphasises value of saltmarsh as a natural system and crucial to environmental health. B. Supporting of restoration of tidal flushing. C. Values saltmarsh as carbon storage. 	<ul style="list-style-type: none"> A. Maintaining this has been identified as a high priority management action. B. This has been identified as a high priority management action. C. Maintaining this benefit is a part of other management actions in relation to the saltmarsh.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
EG	Community feedback form	10/4/2019	<ul style="list-style-type: none"> A. Wants saltmarsh left as it is. B. Suggests development would be detrimental to wildlife by reducing habitat. 	<ul style="list-style-type: none"> A. Scientific studies have demonstrated intervention will be of benefit to the saltmarsh. B. No development has been proposed that will reduce wildlife habitat.
RM	Community feedback form	18/4/2019	<ul style="list-style-type: none"> A. Desires plantings for wildlife corridors and bird habitat. B. Desires dog exercise area. C. Desires picnic area with walking paths. D. Desires facilities for sports and/or community clubs E. Desires a motorbike track. F. Suggests flats are not suitable for development due to inundation. 	<ul style="list-style-type: none"> A. Plantings will create habitat for birds, but corridors are not considered to be a priority in the context of the landscape location and the species within the area. B. This is included in the passive recreation plan. C. Included within passive recreation area. D. Not currently seen as necessary in the context of available facilities in the region. E. Not seen as compatible with the natural values in the area.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				F. Flats will be free from development and management for nature conservation.
DG	Community feedback form	16/4/2019	A. Supportive of the RAP process.	-
GP	Community feedback form	26/4/2019	A. Supportive of restoring tidal flushing of saltmarsh. B. Values area for biodiversity and ecosystem services.	A. This has been identified as a high priority management action. B. These have been identified as priority management issues.
JB	Community feedback form	24/4/2019	A. Supportive of restoring tidal flushing of saltmarsh. B. Values area as bird habitat. C. Values saltmarsh as carbon storage sink. D. Suggests blocked drains are reducing flushing and should be cleared or replaced. E. Supportive of Council tree planning on old tip site. F. Desires walking tracks on old tip site.	A. This has been identified as a high priority management action. B. Birds will be a priority in any future management of the area. C. Maintaining this benefit is a part of other management actions in relation to the saltmarsh.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				<p>D. This has been identified as a high priority management action.</p> <p>E. Included within passive recreation area.</p> <p>F. Included within passive recreation area.</p>
SO	Community feedback form	2/5/2019	<p>A. Referred to example of Tynwald Park in New Norfolk as potential ideas for Lauderdale</p> <p>B. Desires an additional larger football oval in the area, plus soccer and hockey fields</p> <p>C. Desires bike/walking tracks interspersed with wetland wildlife habitat</p> <p>D. Desires kids playgrounds, outdoor exercise equipment and BBQ facilities</p>	<p>A. This and similar examples were consulted in consideration of plans for the passive recreation area.</p> <p>B. Not currently seen as necessary in the context of available facilities in the region.</p> <p>C. Included within passive recreation area, other than wetland habitat, for which the focus is on restoring natural habitats.</p> <p>D. Included within passive recreation area.</p>
RH	Community feedback form	2/5/2019	<p>A. Desires additional football oval for the Lauderdale football club.</p>	<p>A. Not currently seen as necessary in the context of</p>

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				available facilities in the region.
AJ	Community feedback form	2/5/2019	<ul style="list-style-type: none"> A. Desires park and playground. B. Desires sports precinct. C. Desires BBQ areas and toilets. D. Desires more trees. E. Makes reference to examples in Launceston and Dru Point as to what can be done. F. Desires a bike park and tracks. 	<ul style="list-style-type: none"> A. Included within passive recreation area. B. Not currently seen as necessary in the context of available facilities in the region. C. Included within passive recreation area. D. To be included with revegetation area. E. This and similar examples were consulted in consideration of plans for the passive recreation area. F. Included within passive recreation area.
SH	Community feedback form	2/5/2019	<ul style="list-style-type: none"> A. Supportive of reconnecting saltmarsh areas with tidal movements. B. Supportive of re-planting sea grass beds. C. Desires walking and biking trails. D. Desires areas for reflection. E. Desires bird hides. 	<ul style="list-style-type: none"> A. This has been identified as a high priority management action. B. This has been included as a recommended management action.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
			<p>F. Desires seating.</p> <p>G. Desires disc golf course.</p> <p>H. Supporting of tree planting and suggests arboretum.</p> <p>I. Desires educational signage.</p> <p>J. Suggests football oval boundary could function as a picnic area, with facilities and playground, with reference to Risdon Brook Dam.</p>	<p>C. Included within passive recreation area.</p> <p>D. Included within passive recreation area.</p> <p>E. A bird watching hide was not considered to be a high priority by Birdlife Tasmania.</p> <p>F. Included within passive recreation area.</p> <p>G. Included within passive recreation area.</p> <p>H. Tree planting will be included within passive recreation area, but in more of a natural fashion than an arboretum, which is seen to be too management intensive for the area.</p> <p>I. Included within passive recreation area.</p> <p>J. Not specifically reflected in the passive recreation plan,</p>

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				but these facilities will be available.
CY	Community feedback form	3/5/2019	<ul style="list-style-type: none"> A. Values biodiversity and habitat in area. B. Supportive of restoring saltmarshes and protecting habitat. C. Alludes to importance of water rats in controlling non-native species in local waterways. 	<ul style="list-style-type: none"> A. The benefits of maintaining biodiversity are strongly reflected in management recommendations. B. This has been identified as a high priority management action. C. This species is likely to benefit for the proposed restoration of tidal connectivity to Racecourse Flats.
AP	Community feedback form	3/5/2019	<ul style="list-style-type: none"> A. Desires a disc golf course. 	<ul style="list-style-type: none"> A. Included within passive recreation area.
HB	Community feedback form	3/5/2019	<ul style="list-style-type: none"> A. Provides comprehensive support for a disc golf course. 	<ul style="list-style-type: none"> A. Included within passive recreation area.
RA	Community feedback form	3/5/2019	<ul style="list-style-type: none"> A. Desires disc golf course(s). 	<ul style="list-style-type: none"> A. Included within passive recreation area.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
IS	Community feedback form	3/5/2019	A. Desires a disc golf course.	A. Included within passive recreation area.
OM-C	Community feedback form and phone conversations	May 2019	A. Provides comprehensive support for a disc golf course.	A. Included within passive recreation area.
BM	Community feedback form	28/5/2019	A. Desires fenced, off-leash dog park.	A. Included within passive recreation area.
MC	Community feedback form	30/5/2019	<p>A. Expounds ecosystem services of the Lauderdale saltmarsh, with respect to connectivity with other saltmarshes in the system, habitat for fauna and cleaning of water.</p> <p>B. Promotes community awareness through education.</p> <p>C. Emphasises need for tidal flushing of saltmarsh and maintenance of drains to facilitate this.</p> <p>D. Opposed to development around the reserve.</p> <p>E. Wants cattle grazing ceased on the edge of Racecourse Flats.</p>	<p>A. Ecosystem services of the saltmarsh have been considered extensively in the preparation of management actions.</p> <p>B. Several educational signs are proposed within the passive recreation area.</p> <p>C. This has been identified as a high priority management action.</p>

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
			<p>F. Desires passive recreation use of old tip site to be low impact: walking tracks and benches suggested.</p> <p>G. Promotes the value of a community group adopting the area and providing management, education and monitoring resources.</p> <p>H. Suggests consultation with CVA and Birdlife may be valuable.</p>	<p>D. Planning and community consultation recommendations have been made to address this.</p> <p>E. Planning and community consultation recommendations have been made to address this.</p> <p>F. Passive low impact recreation opportunities have been favoured in the proposed redevelopment of the old tip site.</p> <p>G. Lauderdale Coastcare group have been consulted to scope potential involvement in area.</p> <p>H. Birdlife Tasmania have been consulted as stakeholders, with the local Landcare group potentially filling the same niche as CVA.</p>
AR	Community feedback form	31/5/2019	A. Suggests core components of the RAP should be environmental, recreational and educational.	A. These have been considered as key

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
			<ul style="list-style-type: none"> B. Supports restoration of tidal flushing in saltmarsh/ drainage under the causeway. C. Encourages promotion of the understanding of the marsh through education around the smell and significance of natural values. D. Promotes community use of the old tip site with the addition of dog walking facilities, walking tracks (including into the saltmarsh) and mountain biking opportunities. E. Desires educational signs. F. Suggests community engagement will be critical to success. 	<p>components and are reflected in management recommendations.</p> <ul style="list-style-type: none"> B. This has been identified as a high priority management action. C. Several educational signs will be installed, and the Council will continue hosting community education events. D. Included within passive recreation area. E. Included within passive recreation area. F. Council are keen to gain community support for all actions and have consulted extensively for this purpose.
LR	Community feedback form	31/5/2019	<ul style="list-style-type: none"> A. Encourages rehabilitation of saltmarsh with restored tidal connectivity. B. Emphasises values of saltmarshes to bird habitat and mitigation of climate change. 	<ul style="list-style-type: none"> A. This has been identified as a high priority management action. B. These values of the saltmarsh have been

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
			<ul style="list-style-type: none"> C. Desires bird watching facilities (boardwalks and hides). D. Opposed to development on the fringes of the saltmarsh so they can retreat from rising sea level. E. Promotes use of tip as passive recreation zone. F. Desires walking tracks and benches for seating. G. Desires increased wildlife habitat. H. Encourages development of an arboretum. I. Desires educational signs. 	<p>considered extensively in the preparation of management actions.</p> <ul style="list-style-type: none"> C. A bird watching hide was not considered to be a high priority by Birdlife Tasmania. D. Planning recommendations have been made to support this. E. Basis of passive recreation area plan. F. Included within passive recreation area. G. Included within passive recreation area and management recommendations. H. Tree planting will be included within passive recreation area, but in more of a natural fashion than an arboretum, which is seen to be too management intensive for the area.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				I. Included within passive recreation area.
HN	Community feedback form	11/5/2019	A. Desires opportunities for bike riding catering to all levels. B. Desires a community food garden with composting.	A. Bike riding opportunities included within passive recreation area plan, but a dedicated bike park was not considered to be viable in the context of the site and other community desires. B. This was not widely desired by the community and thus has not been included in the current planning for the passive recreation area.
SW	Community feedback form	10/5/2019	A. Promotes the creation of a disc golf course and suggests it could attract users from beyond the region.	A. Included within passive recreation area.
BW	Community feedback form	10/5/2019	A. Desires a disc golf course.	A. Included within passive recreation area.
TS	Community feedback form	10/5/2019	A. Desires a disc golf course. B. Desires an outdoor gym.	A. Included within passive recreation area.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
				B. This was not widely desired by the community and thus has not been included in the current planning for the passive recreation area.
KM-C	Community feedback form	10/5/2019	A. Sees opportunity for more walking tracks. B. Desires a disc golf course.	A. Included within passive recreation area. B. Included within passive recreation area.
AB	Community feedback form	9/5/2019	A. Suggests tip site could be a multi-use recreation area. B. Provides detailed support for a disc golf course.	A. This is reflected in the multi-use plan for the passive recreation area. B. Included within passive recreation area.
CH	Community feedback form	9/5/2019	A. Supports a disc golf course.	A. Included within passive recreation area.
DW	Community feedback form	9/5/2019	A. Promotes the creation of a disc golf course and suggests it could attract users from beyond the region.	A. Included within passive recreation area.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
PS	Community feedback form	9/5/2019	A. Desires additional tracks with connectivity to existing tracks, suggests multi-user capable tracks could suit walkers, bikers and horse-riding.	A. Multiple tracks for different users will be available in the passive recreation area.
KS	Community feedback form	19/4/2019	A. Supportive of saltmarsh restoration. B. Values area for biodiversity.	A. This has been identified as a high priority management action. B. Biodiversity of the saltmarsh has been considered extensively in the preparation of management actions.
RS	Community feedback form	18/4/2019	A. Emphasises importance of tidal flushing for saltmarsh.	A. This has been identified as a high priority management action.
JH	Community feedback form	16/4/2019	A. Supportive of Council process and RAP development.	-
IL	Community feedback form	15/4/2019	A. Suggests greater community awareness is required in relation to saltmarsh and ecosystem services. B. Recommends Council engage with the community with pamphlets, signage, social media, letterbox drops, article in local news.	A. This process and the resultant educational signs in the passive recreation area may address this concern.

Initials (public)/ Name (stakeholder)	Feedback/ discussion method	Date	Key points	Response (with reference to RAP)
			<ul style="list-style-type: none"> C. Supports opening of causeway and restoration of tidal flushing. D. Desires boardwalks for access to saltmarsh without damage. E. Desires signage. F. Desires low impact use of old tip site, including wading tracks for bird watching and nature appreciation (with reference to Tangara Trail)/. 	<ul style="list-style-type: none"> B. This process has included extensive community consultation. C. This has been identified as a high priority management action. D. Included within passive recreation area. E. Included within passive recreation area. F. Included within passive recreation area.
KR	Community feedback form	9/4/2019	<ul style="list-style-type: none"> A. Supports RAP process and passive recreation development of old tip site. B. Desires cycling and walking path between Forest Hill Road and shopping area. 	<ul style="list-style-type: none"> A. – B. Beyond the scope of this project.
JH	Community feedback form	2/4/2019	<ul style="list-style-type: none"> A. Desires new road connecting back of southern Lauderdale to South Arm Road, suggesting potential benefits for fire-fighting and noting there is scope for avoidance of the saltmarsh. 	<ul style="list-style-type: none"> A. Beyond the scope of this project.

Appendix E – Stakeholder Engagements

Inger Visby (Derwent Estuary Program) and Vishnu Prahalad (UTAS): 2/9/2019

Inger specifics

- Raised potential benefits with greater cooperation/better relationship with managers of the adjacent football oval. Noted the adjacent creek running between the oval and the reserve is ostensibly subject to a high degree of eutrophication, leading to significant algal blooms.
- Presumes there is a relationship between creek nutrients and the level of fertiliser use on the oval.
- Closed two culverts to be cleared in the near future will benefit this creek and adjacent past watercourse through section of saltmarsh.
- Noted that the oval managers occasionally dump materials on the adjacent saltmarsh, causing physical damage.
- Noted that restoration of tidal flushing through all new drainage mechanisms would certainly be of great benefit, but is concerned that nothing will be done if it is the only management recommendation, due to lack of funds and uncertainty over management responsibilities.
- Suggested simpler solution (with greater likelihood of success) may be to prioritise maintenance of existing drains, which would be a large job (machinery based) in the first instance, but if maintained regularly from that point on would be a relatively smaller task, potentially within the capabilities of a community group. Quality of East Marsh Lagoon, plus adjacent areas linked to other culverts, is considered likely to improve notable from this simpler measure. Another alternative may just be a better suited culvert at the East Marsh Lagoon site. Noted PWS would need to be consulted with respect to initial maintenance/clearing of the culverts, due to the likely requirement for machinery within the Ralphs Bay Conservation Area.
- Hope that development of area with passive use concept with bring more people to the location and subsequently increase local appreciation of the site.

Vishnu specifics

- Suggested that a short-to-medium-term priority could be restoration of flushing for the purposes of improving general environmental health and lowering the likelihood of risk to humans from things like mosquitos and potential toxins in water or soil. This could be especially important in the near future with expected greater human use of the area following the development of the passive recreation area.
- Restoring ecological function and natural habitats could then be a longer-term goal.
- Noted the potentially large impacts of uncontrolled cats and dogs in the area. Suggested that it was undesirable for off-leash dogs to be allowed in the area (although was supportive of the fenced area for off-leash dog exercise).
- Suggested cat predation could be particularly harmful to the presence of ground-dwelling/nesting birds in the area.
- Noted that rabbits are a locally significant detrimental process due to excessive grazing of saltmarsh plants. Some potential solutions were discussed, such as fencing, although

it was agreed the scale of physical exclusion required would be cost prohibitive and would also limit movements of desirable species such as bandicoots.

- Suggested a sign showing the old distribution of the saltmarsh would be useful and that this could be tied in with discussion of processing that have caused loss of saltmarsh, as well as discussion of potential for saltmarsh movement in the future.
- Desires regular monitoring of vegetation in the saltmarsh (repeat of previous transect studies). In particular monitoring *Tecticornia* is seen as very useful as its growth is an indicator of underlying ecological functions.
- Thinks the site is ideal for a wetland interpretation centre, which would be of great value as a community education resource.

Shared points

- Question to State Growth – what is the timeframe for raising South Arm Road and therefore incorporating new drainage mechanism in the road upgrades? Vishnu noted DSG could potentially benefit from this as the road is currently prone to flooding from the saltwater side as well as impacted by impounded freshwater on the other side.
- Pointed out soil mound with particularly high weed density and noted its suitability for revegetation with native species. Suggested a working bee could target weeds in that area or it could justify more allocation of funds.
- Supportive of water quality testing to address a suite of questions regarding leachates, risks of rapid flushing, nature of water pooling within Racecourse Flats, *etc.* Ideally the results of testing will be used to inform some management actions going forward, such as the need for a bund or redistribution of water.

Mike Newman (Birdlife Tasmania): 3/9/2019

Three main priorities:

1. Migratory shorebird roosting and foraging habitat
 2. Resident shorebird roosting and foraging habitat
 3. Nesting sites for shorebirds
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1. Migratory shorebird roosting and foraging habitat
 - Emphasised that Lauderdale Saltmarsh System is part of a local network of habitats, including Ralphs Bay and Calvert's Lagoon, which are all more broadly linked to the greater Derwent Estuary – Pittwater Area.
 - Together these areas constitute part of an internationally recognised important bird area (IBA) based on surpassing particular thresholds of bird abundance and proportion of global populations.
 - Data collected by Birdlife Tasmanian however, suggests that shorebird use of the local saltmarshes is decreasing. In a large part this is consistent with broader trends and is thought to be primarily the result of habitat loss and degradation on an international level within other parts of the migratory routes of these species.
 - Mike was consulted regarding previous suggestions in the literature that the site was particularly important for the Grey-tailed Tattler and the Whimbrel but agreed that each of these species are so rare (vagrant) now in Tasmania that the site is not seen as specifically important to them (notwithstanding the caveat the trends may change in time). Notes that in terms of migratory species

the Double-banded Plover and Red-necked Stint have the most significant local populations.

- Despite the evident decline in use within recent decades, Mike acknowledges that the measured timeframes are relatively small and that change in habitat use may cycle back around, such that the site in the future could become relatively more important than it is now. One potential driving force for this may be climate change, specifically warming, which could decrease the suitability of northern Australian sites and increase the suitability of southern sites for particularly birds. The Lauderdale Saltmarsh System is part of the most southern system of shorebird habitat in Australia and is at the end of the East-Asian Australasian Flyway.
- Emphasised the importance of managing all components of habitat, including food (within sediments, *etc.*), roosts, and nest sites (including sand spits).
- Loss of roosts in particular is evident around Lauderdale and the greater South Arm area; in particular this may be disproportionately impacting larger bodied species, which appear to effectively disappear from a site when habitat suitability decreases, in contrast with smaller-bodied species, which still stratify themselves across the same locations but in lower densities.

2. Resident shorebird roosting and foraging habitat

- Emphasises the importance of the site to the Pied Oystercatcher, with up to 200-400 birds present in winter.
- Up to 10 breeding pairs present in the area and a relatively high breeding success (~50 %) compared to populations elsewhere (~35 %).
- Several nesting sites have however been lost or compromised due to coastal erosion. Local birds have adapted by shifting to other sites, but some are considered to be suboptimal due to proximity to the road (risk of roadkill) or distance from foraging grounds (energy inefficient), such as when birds nesting on the Racecourse Flats side of the road are forced due to habitat quality to do most foraging on the other side of the road in Ralph's Bay.
- Similar, the local paucity of roosting sites (with many lost to coastal erosion in the broader Lauderdale/South Arm area) sometimes leads to birds roosting on Doran's Road (large roadkill risk), in nearby cleared land, or in highly exposed sections of the marsh, the implications of which for the birds are unknown.
- Raised the possibility of creating a shelter site/roost from a soil mound near East Marsh Lagoon. Also suggested it may be useful to explore the feasibility of a floating roost site in Ralph's Bay, adjacent to the Dorans Road saltmarsh.
- Doesn't support a bird hide in the area due to there being insufficiently interesting species to attract most bird watchers. A bird hide is thus likely to be an unwarranted disturbance and waste of resources.

3. Nesting habitat for shorebirds

- Concerns about birds nesting on road in busy traffic.
- Notes Lauderdale is a relatively successful site for resident breeding shorebirds, with anecdotal evidence suggesting this is due to relatively low levels of dog use compared to equivalent local habitats like Mortimer Bay.

- Notes end of sand spit is no longer a viable nesting site – refers back to issue of birds being forced to shift into suboptimal habitats.
- Several examples of birds adapting by use of novel nest sites, but future productivity at such sites is uncertain, with some observations suggesting the sites will have little success.
- Noted breeding does occasionally occur around East Marsh Lagoon, but with difficulties arising from dispersal distance to foraging areas – noted potential observations in recent years of adults and juveniles moving through culverts but was not certain of this.
- Secure nest sites with no disturbance are seen as a priority.

Susan Hovington (Lauderdale Coastcare Group): 4/9/2019

- Desires connectivity of the passive recreation area with other tracks and adjacent suburban access points.
- Connectivity with local area also important through thematic signs emphasising the local environment.
- Specified that any signs installed in the area should be graffiti-resistant and made to last, using materials such as Replas.
- Desires community spaces within passive recreation area.
- Made reference to Ross Commons management and how it has become more refined over time, with current efforts focussed on fine scale improvements like habitat enhancement, biodiversity of plantings, species-specific plantings, and aquatic ecology. It was noted that any restoration efforts within the Lauderdale Saltmarsh System may have to build towards fine scale improvements such as those being applied in Ross Commons, with coarser efforts required first as a matter of practicality.
- Within the passive recreation area:
 - Requests that tree planting considers the potential for deep roots compromising the containment of contaminants in the old tip site.
 - Requests dense plantings in areas 9 and 10 of passive recreation concept, primarily for bird and bandicoot shelter, with birds being a particularly high priority.
 - Raises issue of cats and dogs and potential negative interactions with wildlife (but supportive of fenced dog exercise area).
 - Requests that seating is not made of wood and instead uses graffiti-resistant and durable materials such as Replas and that seating is suitable for those with reduced mobility, including arm rests; also desirable for configuration of seats to promote social engagement (recommended Kimberley brand seats).

Tim Leaman and Mia Potter (Department of State Growth): 4/9/2019

- Stated that it is not a priority to replace the road in the short to medium-term.
- Similarly, the expenses related to road upgrades and or specific culvert alterations that would alleviate current blockages (e.g. the installation of four culverts instead of three, or the creation of one large box culvert) are not considered to be feasible within current and projected budgets and priorities of project delivery.
- Expressed willingness to investigate the responsibility of the maintenance contractor to maintain the flow within current culverts and were unaware of that this had not already been undertaken under existing maintenance contracts (and advised that this would be looked into internally).

- Expressed willingness to continue a regular inspection and maintenance routine.
- Agreed that from the perspective of insurance and liability, this type of work is better undertaken by State Growth and their contractors as the relevant responsible parties.

Karen Richards (Threatened Species Section zoologist, DPIPWE): 5/9/2019

- Supports reconnection of tidal movements but has concerns over the potential for increased water flow to disperse contaminants from the old tip site; thus, is strongly supportive of any soil and water testing and mitigation measures that could be put in place to limit the potential pollution issues.
- Threatened species priorities are largely the saltmarsh looper moths; the Chequered Blue is a lesser priority based on the understanding that it is seemingly more widely distributed with a potentially larger population.
- Notes that it would be ideal to have a greater understanding of looper moths on site in order to inform management.
- Other threatened fauna species known from the broader area are not considered as a great a priority at this site due to ecological resilience (e.g. Eastern Barred-bandicoot), habitat preferences extending well beyond the scope of this project (e.g. marine mammals and eagles), or priorities aligning more strongly with other organisations (e.g. migratory birds and Birdlife Tasmania).
- Supportive of the potential use of citizen science in the area to improve knowledge of threatened species, including with the assistance of educational signs; noted that signs for the threatened lepidopterans could include photos of the larval life stages and that TMAG may be able to contribute these.

Eric Woehler (Birdlife Tasmania): 6/9/2019

- Suite of concerns and priorities were consistent with those of Mike Newman.
- Aware of issues relating to lack of tidal connectivity and has had discussions with State Growth (Tim Leaman) regarding similar issues around the road at South Arm neck.
- Emphasised connectivity (inter-reliance) of Ralphs Bay and Lauderdale saltmarshes with associated habitats elsewhere in the DEPA.
- Discussed the impacts of overseas habitat loss (within the East Asian-Australasian Flyway) on decreasing populations of migratory species, however noting that local habitat impacts exacerbate these impacts.
- Agrees that significant species within the Lauderdale Saltmarsh System are the Pied Oystercatcher, Red-necked Stint and Double-banded Plover.
- Acknowledges that the Grey-tailed Tattler and Whimbrel have been recorded in the area but are very infrequent.
- Discussed local roosts and nest sites being relatively scarce and suffering from erosion.
- Supportive of investigation into the feasibility of artificial roosts in this area and notes the effectiveness being found elsewhere (e.g. Victoria).
- In relation to passive recreation area, is conscious of potential increased intrusion into the saltmarsh, noting the past history of 4WD damage and motorbikes.
- Supportive of revegetation to create general bird habitat within passive recreation area.
- Noted that any future weed management should include awareness of the potential invasion of Sea Spurge (*Euphorbia paralias*).
- Supportive of future seagrass restoration plans, noting the potential benefits to a multitude of species, including threatened handfish.

Matt Lindus and Rowena Hannaford (Tasmania Parks and Wildlife): 10/9/2019

- Noted that main management issues in this area are mostly in the northern section of Ralph's Bay, however the southern section adjacent to the saltmarsh are considered high priority conservation values.
- Primary issue that arises around the Doran's Road saltmarsh area are occasional free-roaming dogs.
- Shorebirds and any potential detrimental impacts upon them are the number one priority in the broader area – considered to be the most conservation significant value.
- Big issue PWS is the issue of jurisdiction and the importance that any work on their land is undertaken with their approval and follows their processes. They don't want a scenario where any projects are being undertaken on their land informally or semi-formally, without due process. Foresee potential issues of liability in such scenarios and impact on reserve values if proper assessment processes not undertaken.
- Have reservations about disturbance of the old tip site and the potential for contaminants to disperse into the conservation area.
- Have concerns about shorebirds being pushed onto the roads by various processes and want that factored into decision making. Suggested it may be beneficial to place some signs in the area raising awareness of the potential for shorebirds to be on the roads.
- Acknowledge the benefits (needs) for the improved tidal connectivity to the Racecourse Flats and East Marsh Lagoon areas. However, they have concerns about the initial level of disturbance required, which goes beyond merely removing the sand obstructing the inside of the drains. PWS concerns were around recent CCC work to clear existing drains that did not fully consider how to clear existing drains and keep them clear - i.e. clearance of vegetation - and timing to minimise impact on shorebirds. PWS support clearing existing drains but concerned they will continue to re-silt due to design and location. Support installation of larger culverts described as per Management action 4 along with monitoring and mitigation options (actions 1-3) as would achieve better flushing of saltmarsh. If managed correctly, once installed there should be minimal maintenance works required in/adjacent to Ralphs Bay CA as opposed to regular silt removal and drain excavation.
- Stated that their preference is for any sand shifted from the areas of the drains to be completely removed from the site, rather than be deposited somewhere nearby where it may damage habitat values and/or be subject to coastal processes such as erosion, resulting in redispersal and potential new issues or re-blocking of the drains.
- Emphasised the importance that any restoration or maintenance works in relation to the drainage culverts and tidal connectivity is undertaken outside of the shorebird breeding season (September to April inclusive) – this is consistent with their own activities and would be a condition of approval for any works on their land that overlaps with potential shorebird breeding habitat.
- In relation to the development of a passive recreation area, they would be concerned if trails or other recreational opportunities were too close to conservation areas and create the potential for conflicting uses (such as intrusions into the conservation area by dog walkers or informal trails formed through desired routes). In particular, the creation of a dog exercise area is seen as a potential risk if it expands the disturbance

from dogs in surrounding areas. It is seen as inevitable that people will start walking their dogs on trails outside of the exercise area and it should be noted that people are likely to walk their dogs to the area from Lauderdale, rather than just drive to the location and let their dog off within the fenced area. In addition to the previously mentioned dogs roaming Doran's Road saltmarsh they note they have seen dogs in East Marsh Lagoon in association with people on bikes.

Justin Burgess (Clarence Council (Natural Asset Management)): 27/8/2019 (consultation done by Inspiring Place)

- Was supportive of the plant species list proposed for plantings on site, noting that CCC had focussed on resilient species in their shelterbelt planting to date and had less focus on all being from local communities/endemic.
- Noted that CCC plantings have had about a 50 % strike rate so far and that the main factor limiting success is the dry exposed conditions and the tough clay soil that the tip was capped with. To combat this, plantings undertaken with Conservation Volunteers Australia (CVA) groups ensured that the soil was dug out and native soil media mix added with water crystals to promote survival. In these plantings they have observed some dieback of growth tips but aren't sure whether it's the dry near surface soil itself or related to the roots penetrating into the old tip contents below.
- Noted that they've planted *Eucalyptus globulus* on site and that there are already some doing well on the lower ground near the road entry. Noted that *E. morrisbyi* has survived up top, with plantings of that species focussing mainly on the northern slopes. *Bursaria spinosa* and *Acacia* species have done well.
- Noted that there has been good natural regeneration of wallaby grass would be supportive of more planting of kangaroo grass if possible.
- Weed management was noted as a big concern for the area as funding for it has considerably dropped each year since the tip was capped. Was hopeful this RAP would allow adequate project based funding to address the key weeds such as: African Boxthorn (some bushes the size of small sheds on the SE corner of tip face slope); Spanish Heath (though recently some contractor were engaged to treat the developing generation of plants), Canary Broom, Boneseed and other smaller infestations of Tree Mallow, Briar Rose, Asparagus fern (on lower ground near the Bayview Rd end of saltmarsh).

Appendix F – References

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