CASE STUDY

COASTAL RISK MANAGEMENT PLAN

Department of
Primary Industries and Water

Tasmania
Explore the possibilities

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1. Introduction

Background

In mid 2006, the Department of Primary Industry and Water (DPIW) initiated the Climate Change and Coastal Risk Management Project (the Project) to provide principles and practical tools to assist planning authorities plan and manage assets and values vulnerable to sea-level rise, inundation and erosion in the coastal zone.

The Project was undertaken in accordance with Australian Standard Risk Management Principles and is being conducted in parallel to related projects, in particular:

- The Clarence Foreshores Project being conducted by the Clarence City Council which is focused on determining options for planning responses to hazards in the coastal zone;
- The development of a regional planning program for the Cradle Coast and other region; and
- The Climate Futures for Tasmania project, coordinated by the Antarctic Climate and Ecosystems Cooperative Research Centre, which is developing high resolution climate projections for Tasmania for this century, and has acquired LiDAR high resolution information for priority regions around the State.

The Project also builds on the range of information being developed at the national level relating to climate change projections and risk management principles for planning and management.

The CCCRM Project is being developed in three main phases.

- Phase 1: Provision of best available information to develop sea-level rise probability charts for the 21st century.
- Phase 2: Identification of significant infrastructure, assets, resources and development of *Tasmanian coastal vulnerability to climate change and sea-level rise, 2nd edition* (Sharples 2006).
- Phase 3: Identification of good practice risk management principles for assets at different levels of risk (based on research of other jurisdictions).

This document relates to Phase 3 of the Project.

Project Aims

The aim of the Project was to test a Draft Template Risk Management Plan and associated Guidelines developed by DPIW by applying them to two case studies, covering particular categories identified as priorities during Phase 2 (see DPIW 2008 *Climate Change and Coastal Asset Vulnerability: An audit of Tasmania's coastal assets potentially vulnerable to flooding and sea-level rise*, available from www.dpiw.tas.gov.au/climatechange). The categories were:

- Natural reserves;
- Community/public building;
- Sewage treatment plants and the pumping stations leading to them; and
- Local roads.

Actual sites were selected for case studies of sites which covered these categories. Pitt & Sherry were selected to undertake the case studies.

Each area had a risk management plan developed for it based on the process outlined in the draft Template. The risk management plans focused on identifying the assets and values in the coastal zone at risk from inundation, erosion and sea-level rise and the steps required to be taken to mitigate those risks. The Water Research Laboratory (WRL) of the University of NSW provided the analysis and calculations of sea level rise and wave run up in the two case study areas. The consultants applied those calculations to the draft Template and assessed how effectively it could be utilised to produce risk management plans for the two areas.

As a result of testing the draft Template through two case studies, feedback was given on the draft Template and associated Guidelines. The modifications and refinements recommended to the draft Template and Guidelines were adopted by the project Steering Committee and incorporated into the final documents.

Example Case Study

The case studies developed as part of the project were based on information provided by partner organisations, but did not involve the full consultation processes with the relevant local Council, communities and private landowners that would in practice be essential in applying these tools. The conclusions in the case studies are therefore highly provisional.

Accordingly, to further assist coastal decision makers, an example case study has been developed.

The case study is for “Area A”, which is an amalgam of information from the actual sites assessed. It is made available to provide a “worked example” of how the Template can be populated.

Significant changes have been made to the information presented in the original case studies. The Agency does not guarantee the accuracy or otherwise of the information presented, and the example case study should not be relied upon for on-ground planning.

2. Area A: Example Case Study – Using DPIW Risk Management Template

2.1 ESTABLISH THE CONTEXT

2.1.1 Previous Assessment

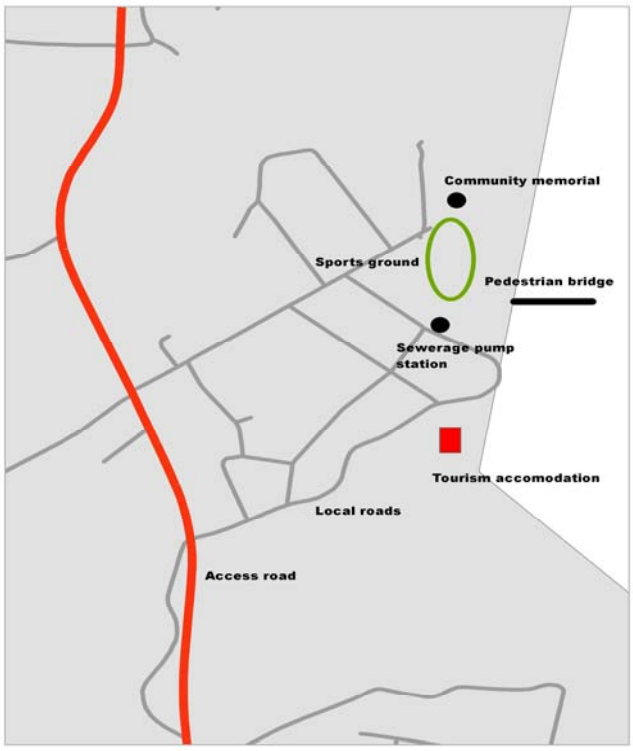
Information for Area A has been complied from various sources.

The location has been highlighted at possible risk because of anecdotal community feedback and on-ground observations over a number of years. In addition, the following information sources confirm that the area warrants detailed consideration to determine the level of risks to the whole site and / or specific assets, and to highlight possible mitigation options.

Level of Risk Assessment	Comment
Location has been highlighted as at risk via topographical maps	✓
Sharples Report indicates possible inundation risk	✓
Calculations of Still water sea levels	✓
Assessment of extreme tide events	✓
Detailed storm surge and wind wave calculations	✓

[Note: describing the level of Risk Assessment previously undertaken is considered a useful part of setting the Context as it quickly gives the assessor a snapshot of what relevant data has already been compiled for the site in question. Including a location map gives a quick understanding of the spatial context of the area in question.]

2.1.2 The Location / Asset



2.1.2.1 Asset Description

	Description
Name of asset	*Area A, adjacent to Beach B. Assets include oval and associated infrastructure (watering system, toilets, grandstand), sewerage mains and pump station, foreshore and riparian area, walking trails, open space, picnic space, public roads, cemetery, houses set back from the foreshore, natural assets – vegetation, beach*
Asset life	*The asset lives from present day vary for each of the assets – from about 10 years (re some public infrastructure) to about 60 years (re houses and significant buildings)*
Location	
Topography	*This is a flat low lying area with no real dune formation behind the beach, which fronts a bay. All relevant sections are at a level of 2.5 m above AHD (Australian Height Datum). or below.*
Geomorphology	*Generally flat sandy shoreline.*

2.1.2.2 The Notional Life Span of the Asset is 40 years.

The Agreed Time Horizon for assessment is to the year 2050.

[Note: this was utilised as the time horizon to be consistent with the Intergovernmental Panel on Climate Change (IPCC) calculations which use 2050 as one of their time horizons. Also a number of the physical assets in the area average a remaining life span in the region of 40 years.]

2.1.2.3 Asset Services and Values

Value	Specific Issues	Who Benefits?	Importance
Economic	*Sporting facilities attract visitors to Area A*	*Local Community and visitors*	*Valued and used by the community*
Social/Cultural/ Historical	*Community Hall & sports ground is the main local recreational and sporting facility.* *Cemetery is of historical importance*	*Local community and visitors*	*Strong identification and ownership by local community*
Political	*Various projects (Landcare, community Hall) have been government funded*	*Local community and Council*	*Significant grants obtained in the past*
Environmental	*Relatively high natural values.* *Very active local Landcare group with various completed works on ground including track along creek, riparian revegetation and coastal rehabilitation of veg and access to beach.*	*Local community and visitors*	*Wetland is used by migratory birds. Track and vegetation actively managed by Landcare group and community*

Table 2.1.2.3: Values of the Asset

Sewerage Reticulation and Pump Station

Length	Remaining life	2004 Replacement costs
760 lm	25 years	$130,000
110 LM	45 years	$25,000
730 lm	55 years	$130,000
PUMP STATION	30 years	$130,000
	Say total	*$415,000*

Stormwater Reticulation

Length	Remaining life	2004 Replacement costs
575 lm	25 years	$125,000
125 lm	45 years	$40,000
240 lm	55 years	$60,000
	Say total	*$225,000*

Water Reticulation

Length	Remaining life	2004 Replacement costs
400 lm	25 years	$50,000
475 lm	55 years	$65,000
	Say total	*$115,000*

Roads and Bridges

Road Name	Length	Type	Remaining Life	2004 Replacement costs
Road C	130 lm	U/asphalt	25 years	$125,000
Road D	240 lm	U/Flush seal	25 years	$150,000
Road E	250 lm	U/Flush seal alternate	20 years	$90,000
Road F	520 lm	R/gravel	146 years	$140,000
Road G	285 lm	R/gravel	136 years	$85,000
			Say total	*$590,000*

Council Buildings (Not Including Contents Values)

Building	Remaining life	2004 Replacement costs
Oval Amenity building	40 years	$270,000
Toilets	45 years	$65,000
Community hall	60 years	$205,000
	Say total	*$540,000*

Other Buildings (Not Including Contents Values)

Building	Remaining life	2004 Replacement costs
Cemetery	100 years	$250,000
	Say total	*$250,000*

Total estimated full asset replacement cost within the Area A foreshore area: Approximately: $2,000,000.

[Note: The above information highlights further the economic value of the area. The information will be in different formats depending on Council data and will need to be compiled by Council officers or the relevant infrastructure manager in a manner relevant to the questions being asked. This level of detail is necessary if the later parts of Template in relation to priorities and mitigation are to be followed through with a meaningful result.]

2.1.2.4 Existing Controls

Hazard	Existing Key Control Measures
Coastal Flooding	*Development controls in planning scheme set finished floor levels and setbacks.*
Coastal Erosion	*Revegetating existing small dunes. Controlling access points to protect coastal vegetation. Revegetating the riparian area along the creek. Development controls in planning scheme set finished floor level and setbacks.*

2.1.3 Context

2.1.3.1 Hazards

The Hazards targeted by this Risk Management Plan are **coastal flooding** and **erosion**, and the way they are exacerbated by climate change and sea-level rise.

[Note: A reasonably succinct, accurate description of the asset hazard assists in then defining meaningful Success Criteria.]

Area A Foreshore

- Area approximately 10 Ha marginally below 3.00 AHD ground level, with some of the periphery areas at 1.00 AHD.
- Water, stormwater, sewerage reticulation and pump station invert levels are generally at or below (mean sea level) 0.00 AHD.
- Generally the established private dwelling floor levels are at approximately 3.00 AHD. These are set well back from the foreshore.
- Inundation of all reticulation services within the precinct would cause damaging erosion as the infrastructure is bedded within sand and shell sediment which is extremely susceptible to water saturation.
- The pump station discharges approximately 500 tenements directly across from a River to the Treatment Plant by means of a submerged rising main. This main would be totally susceptible to storm event damage and localized flooding of the local River.
- In the event of inundation or storm events the gravel roads along the foreshore would suffer damage caused by inundation and erosion. The internal sealed roads would possibly not suffer damage by erosion however would be susceptible to the collapse of the road base and sub-grade materials after prolonged saturation.
- The toilet block on the foreshore would be subjected to severe storm event erosion; however the impact of an event to the Community hall would possibly be to lesser extent. Inundation would cause damage to; floor coverings, low level damage to wall and door fixtures and finishes, furnishings and floor mounted appliances; and damage to low level electrical wiring. Possible structural damage may be incurred in the event of land gales.

2.1.3.2 Stakeholders

Stakeholder	Role	Motivation or Concern	Engagement
Local Landcare Group	Rehabilitation and maintenance	Care for the natural environment	Around 15 members, keen to protect local natural values and assets
Local Residents	Live here	Risk to private property damage	Source of volunteers. Unknown as to knowledge of risks
Local sporting groups	Main users of field	Risk of damage to facilities	Source of volunteers

Stakeholder	Role	Motivation or Concern	Engagement
Council	Providing and maintaining public infrastructure	Providing good quality facilities through effective asset management and funding	Reasonable knowledge of assets and exposure to risk
Primary school	User of local facilities	Loss of community and sporting facilities used by school	Strong community networks and capacity to raise awareness
Community Hall management committee	Oversee management of hall	Risk of damaged facilities	Generally aware of risk
Visitors	Use beach and oval and walking tracks	Loss of beach, damage to environment	General low awareness to risk
Other State Agencies	Environmental regulation Emergency management	Regulator	High for regulatory role; less for specifics of Area A

Table 2.1.3.2: Relevant Stakeholders, their roles, motivations, and levels of engagement.

2.1.3.3 Other Key Elements

Statute	Level	Relevance
Land Use Planning and Approvals Act 1993	State and Local	Assess future development proposals against assessment criteria dealing with sea level rise and risk of inundation.
State Coastal Policy	State and Local	
Local Planning Scheme	*Local Government*	Standard …

Table 2.1.3.3(a): Relevant Legislation

2.1.3.4 Success Criteria

The successful management of this asset will require the following key objectives to be met:

- Community facilities such as walking tracks, picnic areas and recreational space to be inundated for no more than 3 days a year.
- Oval to be inundated no more frequently than once a year for no longer than six hours (to allow grass to recover from saline inundation).
- Public roads to be inundated for no more than 2 hours, only once a year or less.
- Community Hall floor level to remain 300 mm above the 100 year ARI (1% AEP) for the remainder of its life span.
- Sewerage pump station has emergency spills due to inundation or water ingress from rising ground water level, less than once every 10 years for life span of asset.
- Community housing floor levels to remain 300 mm above the 100 year ARI (1% AEP) for the asset life.
- Environmental assets maintained for time horizon of study (defined as to 2050), and specifically the beach is maintained for its current purposes for the time horizon of the study.

[Note: The above are indicative only. Success criteria will be developed after appropriate consultation.]

2.2.2 Future Vulnerability

2.2 IDENTIFY THE RISKS

2.2.1 History

Date	Event	Description	Source
January 1994	High tide plus rainfall event	Stormwater backed up in pipes causing flooding of oval, pump station and inland	Newspaper report Council Officer Local residents
Etc etc			

Table 2: Summary of Relevant Historical Events

2.2.2 Future Vulnerability

[Note: This section requires some level of study of the future risks. A description is necessary here to explain and give more detail to the table in Background Assessment. A detailed study incorporating tidal events, sea-level rise scenarios for the projected asset life span, and storm surge calculation may need to be undertaken. This level of analysis may require expert input.]

Taking a mid-range sea level rise scenario (ref) of 0.2m by 2050, and a max tide level of 1.44 m (ref), with a probable R2% wave –run-up (shallow beach zone according to the MASE rule) of 1.7 m (for an ARI of 50yrs) – the combined **ARI 50 yr** event for max sea level of tide/storm and climate change is equal to 0.2 + 1.44 + 1.7 = **3.34** m. This puts a significant percentage of the Area A foreshore area at risk. The AEP of a 50 yr event occurring over the 40 yr lifespan is approximately: 63%.

2.3 ANALYSE

2.3.1 Consequence

Success Criteria	Consequences of failure (Summary)	Consequence Rating
Community facilities such as walking tracks, picnic areas and recreational space to be inundated for no more than 3 days a year	General appreciable decline in services	Moderate
Football oval to be inundated no more frequently than once a year for no longer than 6 hours (to allow grass to recover from saline inundation)	General appreciable decline in services	Moderate
Public roads to be inundated for no more than 2 hours only, once a year or less. Localised damage.	Some disruption (less than 24 hours)	Moderate
Community Hall floor level to remain 300mm above the 100 year ARI (1% AEP) for the remainder of its life span	Isolated but noticeable examples of decline in services Some damage Some disruption	Minor

Success Criteria	Consequences of failure (Summary)	Consequence Rating
Sewerage pump station has emergency spills due to inundation or water ingress from rising ground water level, less than once every 10 years for life span of asset	Illness due to water contamination Beach closure Loss of amenity and environmental values Population displaced for more than 24 hours Significant damage to infrastructure Loss of reputation to Council	Major
Private housing floor levels to remain 300mm above the 100 year ARI (1% AEP) for asset life	Local displacement of people who return in 24 hours Localised damage	Moderate
Environmental assets maintained and beach remains usable in its current form for time horizon of the study	Isolated significant instances of environmental damage that might be reversed with intensive efforts	Moderate

Table 2.3.1 Consequences of not achieving Success Criteria

[Note: Refer to the Example of a Consequence Scales for a local authority, Section 4.1 of the Guidelines, to assist in working out the appropriate consequence rating.]

2.3.2 Likelihood

[Note: To put some useful information in this section requires fairly accurate calculations to have been made as identified in section 2.2.2, and also requires assumptions or probability assessments to have been made. Where information cannot be drawn from calculations on Hazard Likelihood – the Table in the Guidelines under section 4.2 entitled 'Likelihood Scale' taken from the generic scale used in the Australian Emergency Management Framework is useful. A person with technical knowledge of these risks and risk assessment methodology may need to assess the site.]

Success Criteria (selected only)	Current Risk - Likelihood (of Failure)	Future Risk - Likelihood
Community facilities such as walking tracks, picnic areas and recreational space to be inundated for no more than 3 days a year	10%	40% possible
Football oval to be inundated no more frequently than once a year for no longer than 6 hours (to allow grass to recover from saline inundation)	40% possible	90% Almost certain
Public roads to be inundated for no more than 2 hours only, once a year or less.	40% possible	90% Almost certain
Sewerage pump station has emergency spills due to inundation or water ingress from rising ground water level, less than once every 10 years for life span of asset	40% possible	90% Almost certain
Environmental assets maintained and beach remains usable in its current form for time horizon of the study	40% possible	50% Likely

Success Criteria Current Risk Likelihood Future Risk Likelihood

Table 2.3.2: Likelihood of Not Achieving Success Criteria

2.3.3 Risk priority levels

Success Criteria (selected only)	Current Risk – Likelihood (of Failure)	Future Risk - Likelihood
Community facilities such as walking tracks, picnic areas and recreational space to be inundated for no more than 3 days a year	Low	Medium
Football oval to be inundated no more frequently than once a year for no longer than 6 hours (to allow grass to recover from saline inundation)	Low	High
Public roads to be inundated for no more than 2 hours only, once a year or less.	Medium	High
Sewerage pump station has emergency spills due to inundation or water ingress from rising ground water level, less than once every 10 years for life span of asset	Medium	High to Extreme
Environmental assets maintained and beach remains useable in its current form for time horizon of the study	Medium	High

Table 2.3.3(a): Risk Prioritisation

Risk Priority Level Matrix

Likelihood (L)	Consequences (C)				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost certain	medium	medium	high	extreme	extreme
Likely	low	medium	high	high	extreme
Possible	low	medium	medium	high	high
Unlikely	low	low	medium	medium	medium
Rare	low	low	low	low	medium

Adapted from DCC 2006, 40.

2.4 EVALUATE

[Note: The rankings in this table are based on the analysis of the Success Criteria and the information contained in the Guidelines relating to likelihood of an event that would result in failure to meet the Success Criteria and the consequence of this occurring. Specific data, if obtained, will also assist in deciding on the Risk Level Severity for each of the assets examined and the urgency of taking action to avoid failing to meet the Success Criteria.]

Success Criteria	*Risk Level Severity*		*Importance*	*Urgency*	*Timeframe for treatment*
	Current	*Future*			
Community facilities such as walking tracks, picnic areas and recreational space to be inundated for no more than 3 days a year	Low	Medium	Low	Low	10 years +
Football oval to be inundated no more frequently than once a year for no longer than 6 hours (to allow grass to recover from saline inundation)	Low	High	Low	Low	Future action
Public roads to be inundated for no more than 2 hours only, once a year or less.	Medium	Medium	Medium	Medium	Action 5 years
Sewerage pump station has emergency spills due to inundation or water ingress from rising ground water level, less than once every 10 years for life span of asset	Medium	High – Extreme	High	High	Within next 5 years
Environmental assets maintained and beach remains useable in its current form for time horizon of the study	Medium	High	Medium	High	Within next 5 years

Table 2.4: Summary of the Evaluation of Risk Prioritisation

2.5 RISK TREATMENT

2.5.1 Treatment Options

[Note: It will be particularly important to do further work on large-scale mitigation options in areas with identified high-value natural assets, or where natural assets are difficult to quantify and hence may be overlooked. Consultation with the community and other stakeholders becomes particularly essential at this stage – where the most likely options and the process to arrive at them can be workshopped and decided on.]

No	Title	Description	How it will Help
1.	Revegetate	Monitor and maintain natural areas and established vegetation	Retain natural protection of the location
2.	Sea wall or man made erosion protection barrier	Should vegetation be ineffective in extreme events then erosion protection systems could be installed	Modify the risk by reducing the likelihood of inundation.
3.	Accept risk – do nothing to location	Develop a facility relocation strategy	This would in particular apply to the pumping station asset (see below)

Table 2.5.1(a). Risk Treatment Options

[Note: At this point rather than looking at risk treatment options for the asset as a whole, it may be more appropriate to consider individual assets. To do a meaningful evaluation may require taking each individual asset, assessing the level of risk specific to that asset, the existing controls, and treatment options. After the asset evaluation is completed, the assessor would then consider the totality of the site and prioritise mitigation options. Accordingly, Area A is now referred to as the location, rather than 'the asset'. For the purpose of this Case Study a SEWERAGE PUMP STATION has been chosen as the asset to test the Template in consideration of a specific asset.]

No	Title	Description	How it will Help
1.	Relocate pump station and associated reticulation to higher ground	Pump station is a vulnerable asset with both economic and environmental consequences if it regularly gets flooded and fails	Will prevent pump station being flooded and reduce potential for water contamination as a result of effluent overflow
2.	Raise pump station overflow above AHD	Would reduce frequency of flooding but result in some houses no longer being able to gravitate into sewer reticulation	Modify the risk by reducing likely frequency of flooding.
3.	Provide storm surge overflow tank	Storm surge overflow tank would prevent discharge to the environment	Would reduce likelihood of water contamination as a result of uncontrolled effluent discharge and thus protect water quality and environmental values and reduce risk of water born disease
4.	Accept risk – do nothing in the short to medium term to the asset	Develop an evacuation strategy Reduce risk of infection to community Develop a savings plan for a relocated pump station	Low cost Allows for emergency response measures to be identified and practised and the community to be educated Allows fund to be built up for relocation of pump station in the long term

No	Title	Description	How it will Help
5.	De-centralise sewerage system – individual pumps at each house pumping up to main	Main might not be able to take additional load	Would reduce uncontrolled effluent discharge during flood events

Table 2.5.1(b): Risk Treatment Options for the Sewerage Pump Station

2.5.2 Assessment and Selection of Treatment Options

[Note: The Table below requires substantial work to populate. An alternative approach is to develop a paragraph of explanation recommending criteria to utilise when assessing each option. Once this has happened the information may be summarised in a table as shown below. Further data may also need to be gathered in relation to the costing and design of preferred, specific treatment options.]

Criteria	Option 1 - Relocate	Option 2 – Raise	Option 3 - overflow tank	Option 4 - Evacuation Strategy
Cost	$300,000 (est)		?	Minimal
Timing	20 years plus		Medium term	Immediate
Leverage				Possible
Administrative efficiency	Yes		Yes	More difficult
Continuity of effects	Yes		Medium to short term	Short term
Compatibility	Yes		Yes	Yes
Authority	Yes		Yes	Partial authority
Effects on the economy	Most costly		Costly	Least costly
Effects on the environment	Most positive		Positive	No benefit
Risk creation	No		Long term possibly	Yes
Risk reduction potential	All		Most short term to medium risk	Minimal (public safety improved)
Public reaction	Positive		Likely to be positive	Raised awareness. Possible inconvenience.
Individual freedom	No		No	Perhaps temporarily

Table 2.5.2(a): Assessment of Potential Treatment Options
(Note: add additional columns if required)

No	Selected Option	Title	Reason for selection
1.	Revegetate	Monitor and maintain natural areas and established vegetation (including riparian area)	Likely community support and involvement. Relatively low cost.
2.	Sewerage Pump Station	Overflow tank	Cost effective mechanism to reduce risk rating from major to low.
3.	Evacuation Strategy	Evacuation Strategy for the foreshore, oval in the event of a larger than anticipated storm event occurs, and to include pump station overflow planning	Minimal cost. Immediate start. In line with best practice emergency planning.

Table 2.5.2(b): Selected Options and Reasons

2.5.3 Treatment actions

No	Action	Responsibility	Resources	Review
1.	Revegetate	Council, community	Tbd	
2.	Sewerage Pump Station: overflow tank – commence assessment of cost and design	Council		
3.	Evacuation Strategy – commence work developing	Council, SES, Police and other emergency service organisations		Every 5 years, or sooner if an event occurs

Table 2.5.3: Treatment Actions to be Implemented

2.5.4 Suggested Risk Evaluation Table for Each Individual Asset

[Note: Each asset within the chosen location that is indicated as being at risk should have a high-level risk evaluation conducted for it and the Table needs to be populated for each asset. The Table can be applied to any asset. It could be created as an Excel Spreadsheet, but to be consistent with the Draft Template is shown as a Word table.]

Identified Asset	
Sewerage mains and pump station	Location [??]
Asset Description	The pump station receiving waters are assessed as having high value in accordance with the DPIW sewer pumping station guidelines.
Key Stakeholders	Council EPA Community / residents
Estimated value of the asset	
Community benefit	The sewerage reticulation and pump station ensure that raw sewage is rarely discharged to the surrounding environment protecting the public from contact with raw sewage (particularly at the beach while swimming) removing foul sewage odours and protecting the surrounding environmental values.
Risk Analysis Event **Consequence** **Likelihood**	High sea level causes pump station to be inundated with sea water Sea water enters pump station causing inflow to exceed pump station capacity and resulting in raw sewage overflowing to the environment. Also resulting in sea water entering sewage reticulation with possible consequences to treatment plant process. To be calculated using storm surge data and pump station levels.
Consequences	**Public Safety** – Sewage spill causes public illness due to presence of water born disease **Local Growth/Economic** – area gets reputation for problems with sewage spills slowing economic growth **Community and Lifestyle** – foul smells lower public amenity. Regular closures of beach **Environment** – pollution of surrounding environment causes localised loss of environmental values **Public Administration** – short to medium term loss of reputation for Council. Fines imposed by EPA.
Overall Consequence Rating	**Major**
Risk Rating	Calculate from likelihood and consequence assessment

Identified Asset	
Risk Management Strategies Lower Likelihood by:	a) Raising pump station overflow above AHD Estimated cost $#### Impact reduce risk rating to low. b) Provide storm surge overflow tank to prevent discharge to environment and lower likelihood to rare. Estimated cost $##### Impact reduce risk rating to low. Other consequences – increased maintenance costs. Further design required to size overflow. c) Bund Pump station switchboard to prevent storm inundation. Estimated cost $##### Impact reduce risk rating to low. d) Closing beach to reduce public contact lowering likelihood to rare.
Lower Consequence by	No options evaluated
Recommended Treatment Options	
Revise risk rating	

Table 2.5.4: Risk Evaluation Table for Individual Assets

2.6 REVIEW

[Note: A standard part of a normal Risk Management Assessment process would include regular reviews of the process. This allows for the input of new data or where management actions have occurred allows for the level of risk as a result of those actions to be reassessed.]

This plan is to be reviewed every 5-years.

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CONTACT DETAILS

Chris Rees
Manager Coastal and Marine Branch,
Department of Environment, Parks,
Heritage and the Arts

Phone
(03) 6233 3963

Email
Chris.Rees@environment.tas.gov.au