Newcastle City Council

Strategic Position for the Management of Low Lying Areas of Newcastle

Wickham - Maryville - Carrington - Islington

July 2017

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The City of Newcastle

Strategic Position Paper
Low Lying Areas

The City of Newcastle

Introduction

Our climate is changing. The best available science predicts that all aspects of our climate shall be affected. We are likely to see increases in temperature and sea level as a result, in addition to changes in rainfall patterns. This uncertain climate presents challenges to conventional urban planning and Councils are responsible for such planning in the absence of a firm Climate Change Policy from other levels of government.

Newcastle City Council has undertaken detailed investigations into the predicted impacts on flood inundation in low lying land within the Local Government Area. It was found that the low lying suburbs of Islington, Carrington, Wickham and Maryville are particularly vulnerable. Council recognises the value of these suburbs and is committed to developing a plan to reduce the flood risk for residents, properties and businesses.

Aim and Objectives

The aim of the Paper is to identify practical and timely measures that can be initiated to ameliorate flood risk as the predicted impacts materialise. The timing for implementation will be subject to sea level benchmarks referred to as ***triggers***. The strategic position paper will provide a base to guide future decisions of Council, in particular those related to planning policy and the maintenance and renewal of public infrastructure, including funding.

The following objectives guided the preparation of the Paper:

1. Mitigate the predicted increase in flood risk as a result of climate change;
2. Mitigate the predicted increase in groundwater level;
3. Investigate mitigation measures that are cost effective;
4. Maintain service levels for Council owned infrastructure (i.e. roads and drainage);
5. Limit the impact of the measures on private property;
6. Establish a plan that is simple and has the flexibility to deal with uncertainty of climate change;
7. Identify information gaps that require further investigation; and
8. Present a well-informed position paper to the community, based on comprehensive research and investigations

Climate Change Impact

The low lying suburbs of Islington, Carrington, Wickham and Maryville are currently subject to regular inundation during flash floods and king tides. Little can be done to alleviate the flooding because the topography is flat and low lying, being prone to inundation from the ocean and poor drainage. The elevation of king tides inundates some roads to a maximum depth of 0.3m in current conditions. Tide gates are currently in place to reduce ocean inundation. If sea levels rise, the tide gates may no longer be effective and water levels could breach Throsby Creek foreshore and inundate private and public properties.

Numerical modelling was undertaken for a range of scenarios using the best available scientific predictions for climate change. The scenarios included flash flooding and ocean inundation, both from regular king tides and other rarer ocean storms. The modelling found that:

- A sea level increase of 0.3 metres elevates king tides to a point where approximately seven (7) houses in the low lying suburbs would be inundated several times annually. This has been referred to as the tipping point where liveability is threatened because of the increase in inundation. Based on the latest science this is predicted to occur around 2050.

- The extent, frequency and duration of flash flooding would increase having adverse impact on asset values (e.g. property prices and public amenity).

- Once sea levels rise by 0.8m groundwater levels would increase across the area and cause permanent waterlogging of particularly low lying parts of the area. As a result this has been chosen as the planning horizon of the Paper.

These findings present significant challenges and without management measures in place for the future, these climate change impacts could lead to:

- Regular inundation of roads and property by common high tides;
- Inundation at floor level several times a year during king tides;
- Significant risk to motorists and pedestrians during frequent flash floods;
- Elevated groundwater having the potential to degrade infrastructure and building foundations;
- Contaminated groundwater that would leach pollutants from contaminated land into soil and receiving waters threatening marine life and degrading infrastructure; and
- Loss of vegetation due to increased groundwater level and saline ingress.

Flood Water Mitigation

Council has been working with consultants to assess a range of practical options that could mitigate the predicted impacts of climate change. When comparing the costs and benefits of the options it was found that there are feasible measures to protect the low lying suburbs from the predicted impacts.

This finding has led to a commitment from Council to protect the area with the approach documented in the Paper. The following table summarises each of the options for surface water management that have been explored and the related costs.

Option	Description	*Costs (M)
A - Flood Gates	Installation of new flood gates on all stormwater outlet pipes with an arrangement that limits obstruction and associated maintenance due to debris.	**$10-12**
B - Levee + Flood Gates	Construction of an earth levee along the foreshore to protect the entire area from inundation by sea levels up to 2.5m AHD.	**$20-25**
C - Flood Gates + Levee + Pumps	**A combination of the above options with the addition of high capacity pumps to assist in the discharge of stormwater to Throsby Creek/Hunter River.**	**$35-45**
D - Flood Gates + Pumps + Stormwater Pipe Upgrade	Upgrading the larger drainage lines of the area to increase drainage capacity along with high capacity pumps and flood gates	**$50-60**
E - House Raising and Flood Proofing	Elevation of houses above the flood level where foundations permit (not slab on ground). Renovation of other properties using flood resilient materials to reduce flood damage.	**$10-15**
F - Planning Controls	Applying suitable flood planning levels and building design guidelines to reduce flood inundation and associated damages.	**Nil**
G - Strategic Rezoning	Avoiding redevelopment of significant flood risk areas by rezoning to non-habitable uses. Increasing the intensity of use for other areas to compensate for loss of land value. This option involves substantial filling of new housing areas and roads.	**$530-550**

**Indicative costs include construction, operation and maintenance for a 50 year design life*

Option C was found the best performing option when assessing the costs and benefits. The following summarises **Option C:**

1. These measures are targeted at controlling surface water inundation, additional measures are required to control groundwater;
2. The levee and flood gates protect the area to surface water inundation;
3. The pumps are to assist with drainage when sea levels are elevated; and
4. The average height of the levee is 0.8m and the maximum height is 1.5m. This means that the levee can be constructed within the landscape using earth mounds, small block walls and extensions to sea walls.

The foreshore of Throsby Creek is where the majority of the levee length is required as shown in the attached figures. It should be noted that there are limitations of the levee because it would only provide protection for sea levels up to 2.5m above mean sea level. If the sea level rises by 1.5m then regular high tides would overtop the levee without any rainfall.

Groundwater Mitigation

It is predicted that sea level rise will cause a relative increase in groundwater level throughout the low lying suburbs. Groundwater levels are generally 0.5-1m higher than average sea levels and change according to the amount of rainfall that infiltrates the sandy/silty soils of the area. If sea levels rise then the groundwater levels would rise by a similar amount. Preliminary studies by experts in the field found that groundwater could be permanently at or near ground level in parts of Carrington and Maryville if sea levels rise by 0.8m. There is however potential means of lowering groundwater by sub-surface drainage to the Creek/Harbour with sub-surface reticulation networks (infiltration galleries and pumps) connecting to the stormwater system for discharge to Throsby Creek. It should be noted that the methods to control groundwater would be an additional cost to all options and preliminary estimates of **$5-10M** in funding is estimated.

In addition there is uncertainty surrounding ground contamination. The area has a legacy of reclaimed land where progressive filling of mangrove swamps created the urban areas in Wickham, Maryville and Carrington. Historically shipping, coal and mechanical industries, where prolonged storage and uncontrolled disposal of petro-chemicals and toxic waste, has resulted in contaminated ground. Contaminants can leach into waterbodies via groundwater and Throsby Creek has been known to contain contaminants including hydrocarbons and heavy metals.

There is further investigation and design required to better understand groundwater quality/behaviour and effective mitigation measures.

The Strategic Position

The Strategic Position is to **protect** the low lying suburbs from significant flood risk as a result of the predicted impacts of climate change up to a planning horizon of 0.8m of sea level rise.

Council is committed to implementing actions based on the table below. Ongoing monitoring of sea and groundwater levels shall be the method to track the progress of the predicted impacts and identify when trigger points are approaching/have been reached.

Strategic Position Paper
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Phase	Trigger	Actions
1	Adopt Strategic Position	• Monitor sea and groundwater levels • Investigate funding opportunities for future phases • Research climate change science and policy • Review planning controls and zoning maps • Collaborate with stakeholders • Ongoing community engagement
2	0.1m of sea level rise	• Installation of improved flood gates to all drainage outlets • Install high power pumps to assist with drainage from low lying pits • Planning and design of levee
3	0.2m of sea level rise	• Begin construction of levee • Detailed design of groundwater controls
4	0.3m of sea level rise	• Install levee to a height of 2.5m above mean sea level • Install groundwater controls
5	0.4m of sea level rise	• Complete construction of all flood and groundwater controls Operate and maintain controls • Investigate future planning options for when the horizon of the strategic position is reached
6	0.8m of sea level rise	• Implement additional management measures or planned retreat from the area

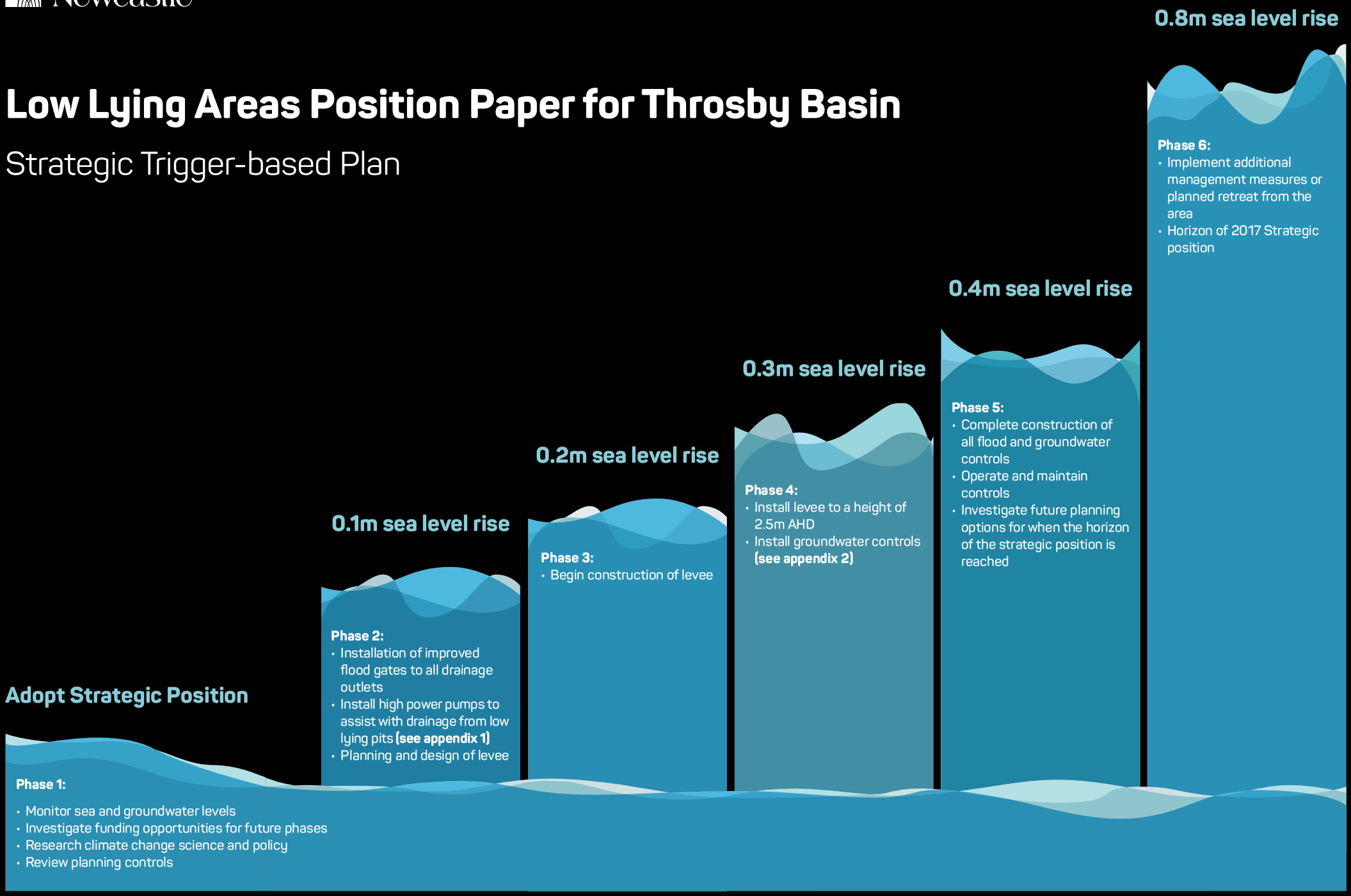
See trigger diagram on following page for more detail and attached map/figures

Preliminary cost estimates of approximately **$45-55M** in funding would be required to install the surface and groundwater controls that have been recommended. It is noted that this is a **long term plan** and there is a high degree of uncertainty around timing of the climate change impacts and the availability of funding. A range of funding mechanisms would be required for implementation and could include Section 94, general revenue, capital works allocation, special rate levy and grants.

Newcastle is not the only location where climate change will threaten low lying urban areas and we can expect there could be research and development into practical mitigation measures in future. It is also likely that a firm position of the state and federal government would be forthcoming in regard to providing a clear policy position on how to adapt to climate change. A flexible approach is required to consider these factors when implementing the Paper and shall be included in the ongoing monitoring component (phase 1).

Low Lying Areas Position Paper for Throsby Basin

Strategic Trigger-based Plan



Planning Implications

Newcastle City Council has been aware of the vulnerability of the low lying suburbs to the impacts of climate change having identified it as a key action in the City wide Floodplain Risk Management Plan 2012. One planning control that Council currently applies is an allowance of 0.9m sea level rise in flood planning levels; this protects properties that are redeveloped from significant flood risk in future. However this does not protect the houses that do not redevelop, nor does it protect essential infrastructure such as roads and drainage. An external planning review concluded that no major change to planning instruments is required and the land use and growth rates proposed are satisfactory. Recent plans such as the Wickham Masterplan, and high density zoning in parts of Islington, can be accomplished in parallel with this strategic position for the low lying suburbs.

It is however necessary to undertake a detailed review of planning controls and how they can be applied once this strategic position is adopted. An audit of zoning maps has also been recommended, in addition to consideration of emergency management. There is a risk that the management measures could fail, or indeed maybe ineffective in an extreme flood event, and evacuation of the area should be considered in consultation with SES. Once a commitment is made to protect the area then a more detailed investigation of the potential outcomes can be done to determine what type of controls are required. For example there might be specific requirements for materials to be used in the construction of buildings to protect them from elevated groundwater levels. There might also be the need to prepare guidelines for residents to protect their homes from groundwater and flood inundation.

Further Investigations required

1. Detailed groundwater investigations
2. Detailed design of surface water controls
3. Detailed design of groundwater controls
4. Sources of funding
5. Climate change science & policy
6. Planning instrument refinement including planning control and zoning map audit.
7. Liaison with utility providers and major land owners
8. Groundwater quality and likely treatment requirements
9. Emergency management in case of an extreme flood event

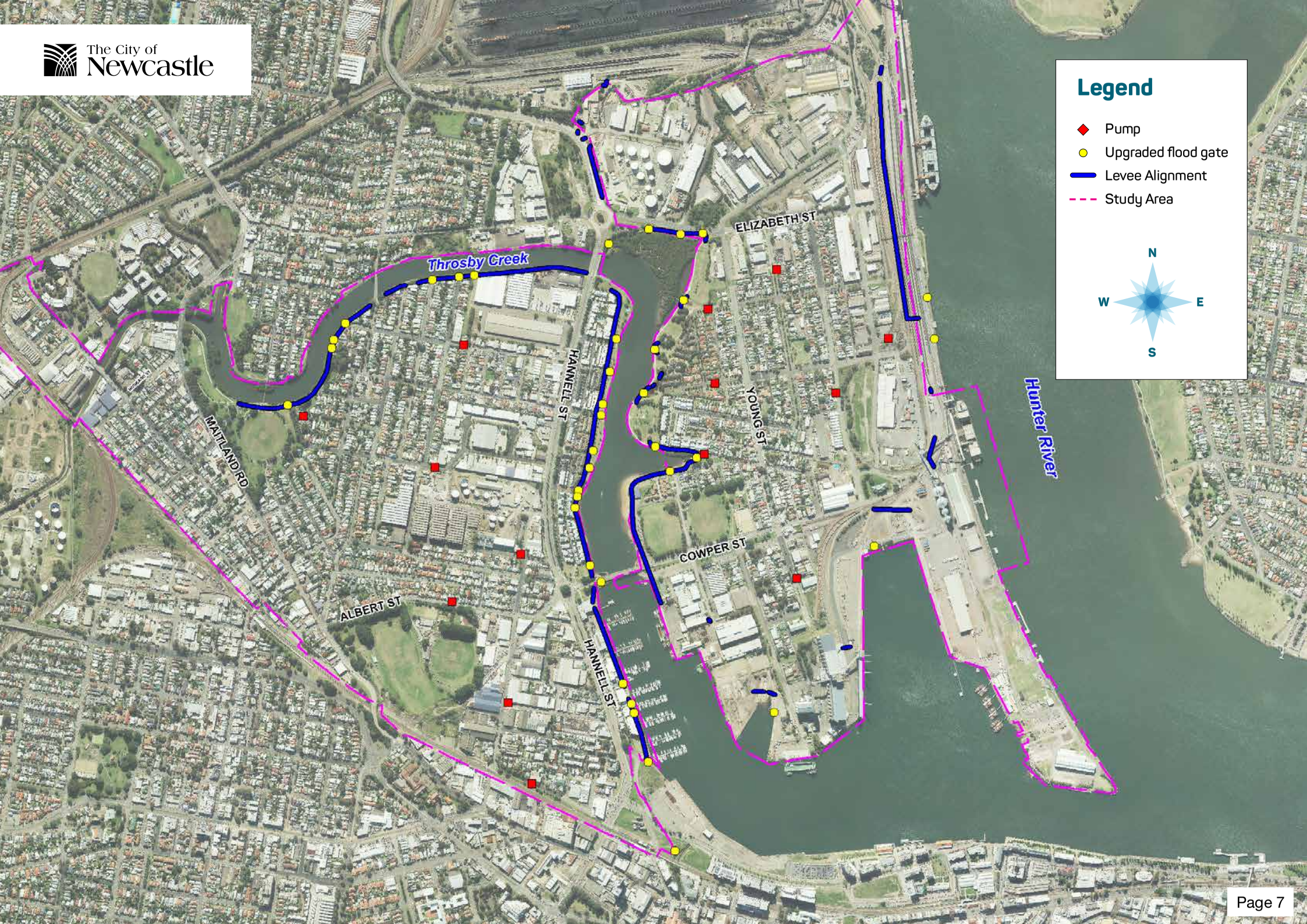
What are the limitations of the Position Paper?

Climate change is not an exact science. The predictions of climate change vary considerably and as such the uncertainty of timing for the impacts is great. We do know that the climate is changing but for example we do not know when and by how much sea levels will rise.

The feasibility assessment of the options is based on a conceptual cost benefit analysis. There has not been a high level of detail applied to the cost estimation of the options or the benefits because of the preliminary nature of this paper. A standard engineering approach has been used for the purpose of comparing options, rather than applying a high level of detail to a specific option.

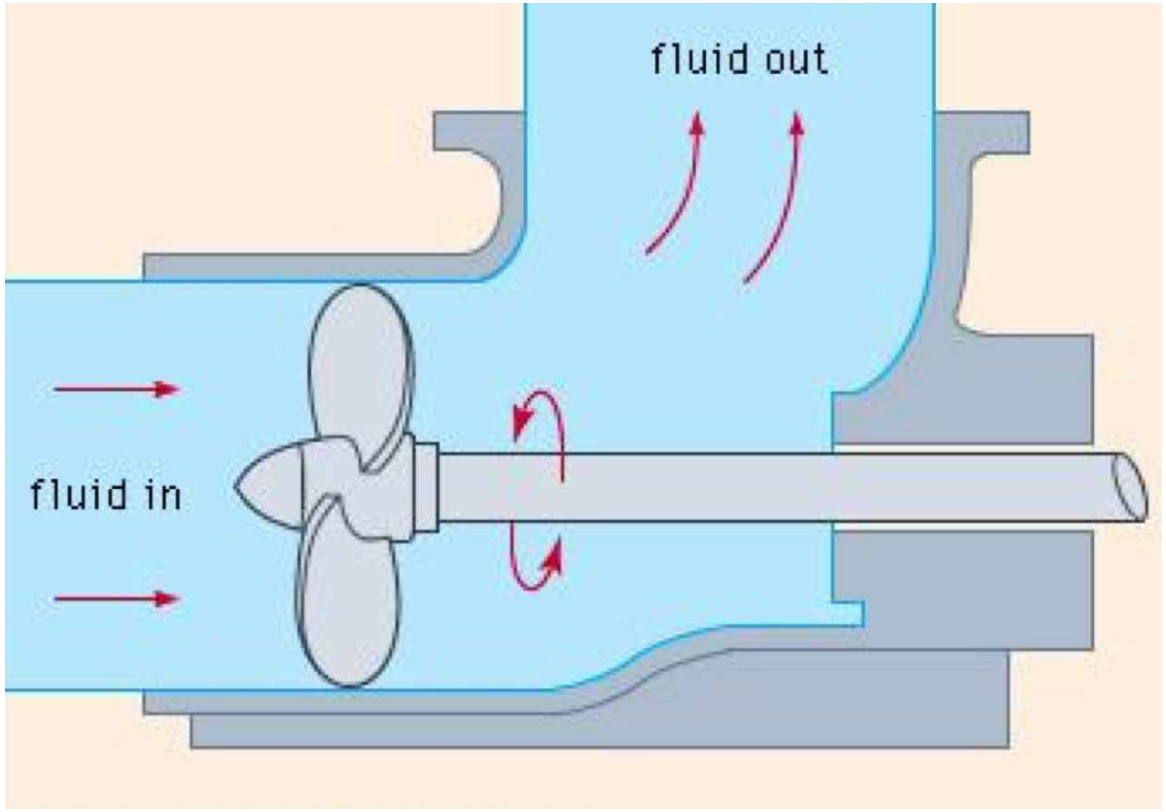
The mitigation measures proposed are only effective in reducing flood risk to reasonable levels up to a sea level rise of 0.8m. We cannot predict for certain if or when this will occur, however there will be a requirement to revisit the Paper if our sea level monitoring records approach this trigger point.

The success of any strategy relies on a shared commitment from all stakeholders. Landowners (both private and public), utility providers and business owners should work together with all levels of government to prepare and implement any strategy for climate change adaptation. Future collaboration and defined roles and responsibilities between stakeholders are essential when implementing the Paper and will need to be considered as part of Phase 1.

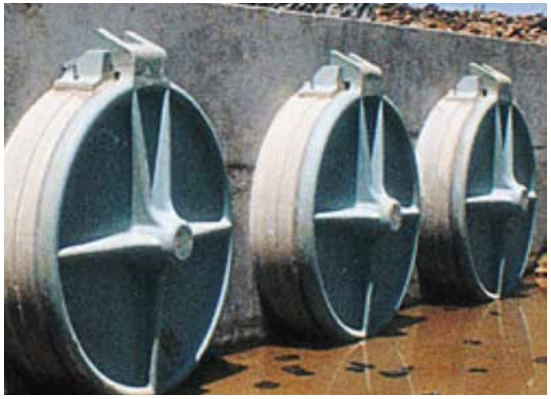

The City of Newcastle
Legend
Pump
Upgraded flood gate
Levee Alignment
Study Area
N
W
E
S
Throsby Creek
ELIZABETH ST
HANNELL ST
YOUNG ST
Hunter River
MAITLAND RD
COWPER ST
ALBERT ST
HANNELL ST

Appendix 1

Pumps and Flood Gates



Pump schematic - source: Encyclopedia Brittannica



Hinged flood gates in Throsby creek

Axial flow pump in action - source: www.kaieteurnewsonline.com

Appendix 2

Levee

Levee: elevated cycleway

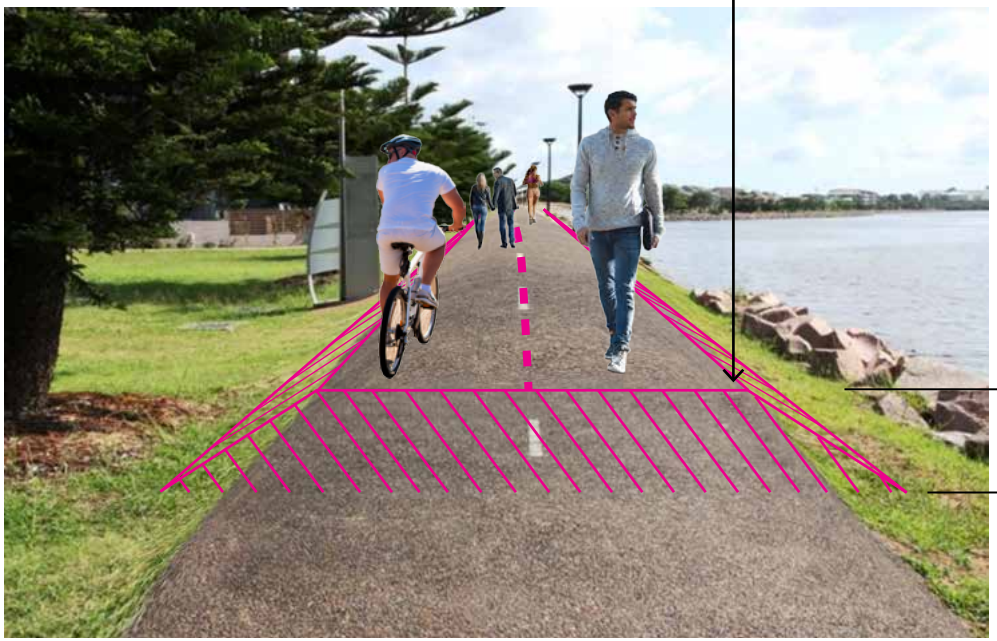


Photo of Throsby cycleway with proposed levee: elevated cycleway drawing.

Levee: elevated creek bank

Throsby creek bank - source: Hunter Water

References

BMT WBM 2015, Strategic Position for the Management of the Low Lying Areas in Newcastle - Scoping Study Final Report

Catchment Simulation Solutions 2016, Strategic Position for the Management of the Low Lying Areas in Newcastle - Stage 2 Inundation Management Options

GLN Planning 2017, Planning Inputs Low Lying Study - Stage 3 Strategic Position Paper

Water Research Laboratory 2015, Groundwater Conditions in the Low Lying Areas of Newcastle

Water Research Laboratory 2017, Community Meeting Powerpoint Presentation - Newcastle Low Lying Areas Management Strategy - Background Information