Community and Stakeholder Engagement Report

Narrabeen Lagoon Entrance Management Strategy (Stage 1 of 2)

Impact level: 2

Consultation period: 10 February to 28 March 2021

Contents

1. Summary

This report outlines the stage one community and stakeholder engagement conducted as part of the Narrabeen Lagoon Entrance Management Strategy project from 10 February to 28 March 2021.

We asked for your thoughts and suggestions on the potential ways the entrance could be managed in the future. We presented an options paper that outlines the way we currently manage the entrance and long-term options being considered. We encouraged discussion and did not limit responses to voting on entrance management options.

This consultation highlighted the diversity of opinion in the local community about the key issues and management objectives for Narrabeen Lagoon. Community feedback also revealed a high level of local and historic knowledge and sense of public ownership of Narrabeen Lagoon.

A variety of themes were identified within the submissions. While no individual theme was represented in the majority of submissions, the two most common themes were:

- Support for further investigation and potential implementation of a sand pumping scheme
- Options that maximise the duration of lagoon entrance open conditions should be prioritised

1.1. Key outcomes

Total unique responses	111

How responses were received	Online Your Say submission form	Completions: 98
	Email/written submissions[1]	Received: 14

Feedback themes	• Support for further investigation of a sand pumping scheme to be installed at Collaroy-Narrabeen Beach. • The entrance of Narrabeen Lagoon should be open as much as possible.	• Support and requests for dredging of the western basin/main waterbody of Narrabeen Lagoon. • Improvements to entrance clearance. • Improvements to Council's emergency response arrangements. • Suggested alternative options.

[1] One respondent provided their submission online via the Your Say form and via email.

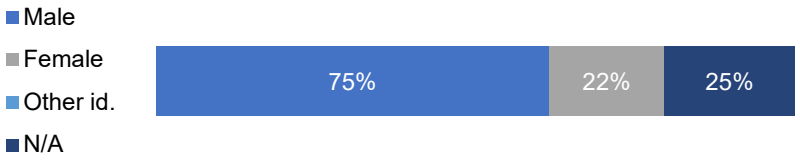
1.2. How we engaged

 Have Your Say	Visitors: 3112	Visits: 4115	Av. time onsite: 1m22s
 Videos	Explainer video: 1		Views: 4,619
 Print media and collateral	Letterbox drop: Properties that received letters were in the 2097, 2099, 2101 and 2102 postcodes. Site signs: Yes		Distribution: Letters were sent to 3,100 properties. Number: 4 signs installed in prominent locations around the lagoon foreshore and close to the entrance.
 Electronic direct mail (EDM)	Community Engagement (fortnightly) newsletter: 3 Council (weekly) e-News: 3 External stakeholder email		Distribution: 20,000 subscribers Distribution: 150,000 subscribers Distribution: 23 external stakeholders were emailed with project details inviting comment. The external stakeholders included all 163 watercraft permit holders for Narrabeen Lagoon.
 Face-to-face	Drop-in sessions were available on three different days: Monday 1 March 2-5pm Wednesday 10 March 4-6pm Saturday 20 March 9am-12pm		Bookings: 5
 Phone	Calendly phone appointments were offered on two different days: Thursday 4 March (6-9pm) Tuesday 9 March (9am-12pm)		Bookings: 0

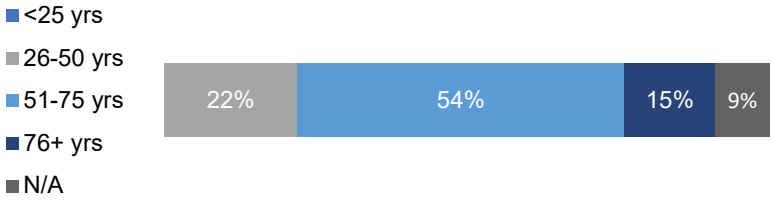
Key stakeholder engagement	Meetings: Presentation at a pre-standing Surfrider meeting	Attendance: 10

1.3. Who responded[2]

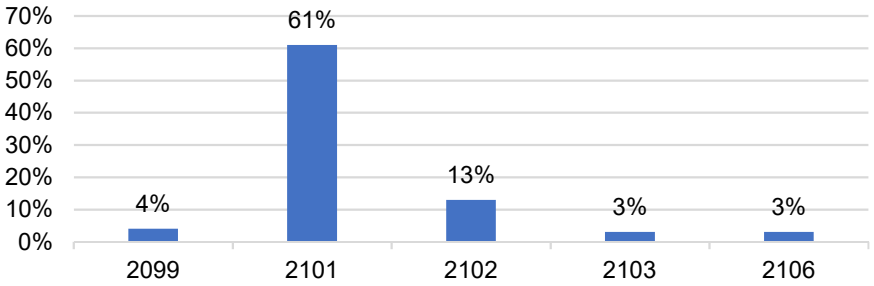
Gender



Age groups



Postcodes



2. Background

Narrabeen Lagoon is one of the Northern Beaches' greatest natural and recreational assets. However, it is also prone to flooding and Council has been managing the entrance of the lagoon to reduce the risk of flooding for close to half a century.

An Entrance Management Strategy is being developed to confirm the best long-term management options for managing sand deposition in the entrance. This will enable a best practice and formalised approach.

Council expedited a preliminary review of the feasibility of a breakwall. It was determined that it was not a feasible option and was therefore excluded from the Options Paper as reported to Council at its meeting on 27 October 2020.

The project's impact level two Community and Stakeholder Engagement Plan was devised on a two-stage approach:

- Stage 1: Public consultation on the options paper to gather input from the community regarding the different options we are investigating.

[2] Demographic data was gathered by request only. The data represented only includes those respondents who provided this detail.

- Stage 2: Public exhibition of the draft Entrance Management Strategy to ensure it is supported by a broad cross-section of the community.

This report outlines the community and stakeholder engagement conducted as part of stage one.

3. Engagement objectives

Our community engagement objectives were to:

- build community and stakeholder awareness of participation activities
- provide accessible information so community and stakeholders can participate in a meaningful way
- identify community and stakeholder concerns, local knowledge and values.

4. Engagement approach

Stage one community and stakeholder engagement for Narrabeen Lagoon Entrance Management Strategy was conducted over a six-week period, from 10 February 2021 to 28 March 2021, and consisted of a series of activities that provided opportunities and platforms for community and stakeholders to contribute.

The engagement was planned, implemented and reported in accordance with Council's Community Engagement Matrix (2017).

The engagement approach was designed to understand the community's feedback on the way we currently manage the entrance and long-term options being considered.

A project webpage[3] was established on our have your say platform with information provided in an accessible and easy to read format. The project page included an explainer video about Narrabeen Lagoon Entrance. We encouraged people to learn more about Narrabeen Lagoon entrance and how Council currently manages this complex issue. We also broke down the video into shorter section should people want to jump to a particular section.

We trialled a new online format to present the options paper and linked people to it from the project page. The online document allowed people to view the information alongside various graphics.

The project page also included some background information, and links to the relevant Council report and webpages.

The project was promoted via onsite signage, resident and stakeholder notifications, our Council E-News and community engagement newsletter.

Feedback was captured through an online comment form embedded onto the have your say project page. An open-field comments box provided community members a space to outline their feedback.

Email and written comments were also invited. Contact details for the project manager were provided as a channel for the community to ask any questions about this project.

There was a lot of technical information contained in the options paper and we wanted to support you as best we can during this consultation.

[3] https://yoursay.northernbeaches.nsw.gov.au/narrabeen-lagoon-entrance-management-strategy

We provided opportunities for people to book a face to face meeting with the project team at the Narrabeen Coastal Environment Centre. As an alternative, we offered bookings for a telephone appointment. We were agile in our approach and, when some face to face meetings had to be postponed due to an emergency entrance management procedure, offered to meet or call the community members at a separate time.

Results provide responses across a spectrum of demographics, expertise, experience and understanding of our local government area.

4.1. Reaching diverse audiences

We worked with our Community Development team (liaisons to our multicultural communities and not-for-profit organisations/community services) and utilised their platforms and networks to share information, increase project exposure and awareness, and reach a diverse audience. An article about the project was included in Council's Religious and Cultural Leaders Newsletter.

5. Findings[4]

This consultation highlighted the diversity of opinion in the local community about the key issues and management objectives for Narrabeen Lagoon. Community feedback also revealed a high level of local and historic knowledge and sense of public ownership of Narrabeen Lagoon.

A variety of themes were identified within the submissions. The table below outlines the most common themes along with Council's responses. Other themes raised are shown in a graph below and all verbatim comments can be read in the Appendix section.

In their submissions, some people told us that they appreciated the way we had presented the information and felt they had learned a lot by watching the explainer video on the Your Say page.

Table 1: An outline of the most common themes and Council's response

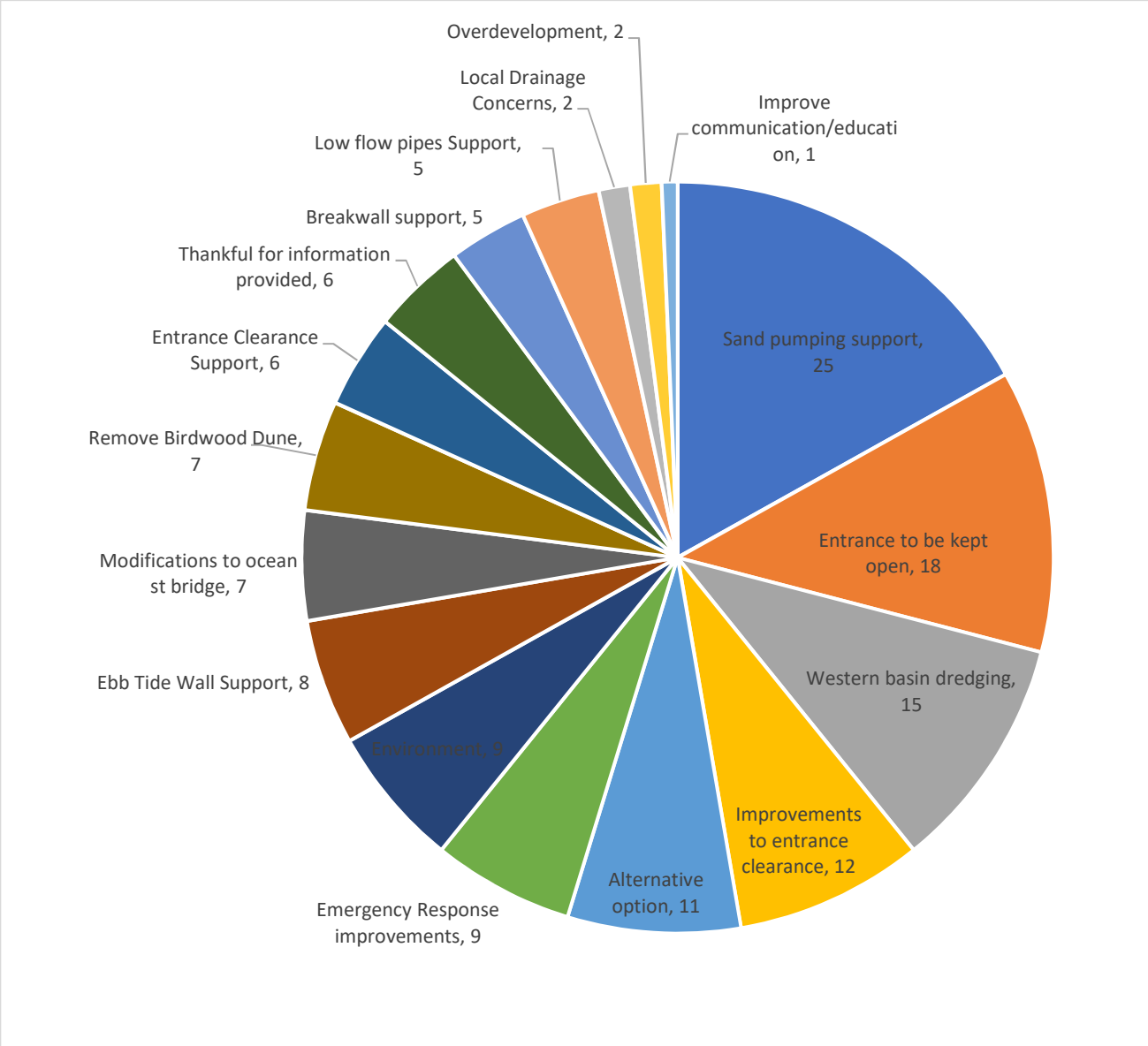
Theme	What we heard	Council's response
Support for further investigation of a sand pumping scheme to be installed at Collaroy-Narrabeen Beach	The most common response that was received from the community was general support for further investigation and discussion on the potential benefits of a mobile sand pumping scheme at Collaroy-Narrabeen Beach. The specific reason for preferencing this option varied, with responses including flood benefits, amenity improvements and potential improved tidal flushing.	The assessment of options in the Narrabeen Lagoon entrance management strategy includes consideration of economic, social and environmental factors. Whilst ultimately recommended options need to be economically and technically feasible, understanding the level of community support for an option informs the likely future acceptance and preference of options.

[4] Community and stakeholder views contained in this report do not necessarily indicate a commitment to a particular course of action.

The entrance of Narrabeen Lagoon should be open as much as possible	A number of submissions outlined the numerous benefits associated with the entrance of Narrabeen Lagoon being open. These benefits related to differing factors including flood risk reduction, improved amenity and improvements to water quality through increased tidal flushing.	Flooding in Narrabeen Lagoon can be driven by rainfall in the catchment, large swell events in the ocean or a combination of both. However rainfall in the catchment is the dominant form of flooding and an open lagoon reduces but does not eliminate this flood risk. A key objective of the Entrance Management Strategy is to improve the duration of open entrance conditions at Narrabeen Lagoon in recognition of the abovementioned flood benefits in addition to secondary water quality and amenity improvements.
Support and requests for dredging of the western basin/main waterbody of Narrabeen Lagoon.	Submissions were received which requested investigation of dredging of the main waterbody of Narrabeen Lagoon. The submissions outlined a range of potential benefits, including recreational amenity, water quality and flood risk.	Dredging of the main waterbody of Narrabeen Lagoon for recreational purposes has previously been investigated by the former Warringah Council. There are unlikely to be any significant flood benefits of dredging the bed of Narrabeen Lagoon in the main waterbody. The management of Narrabeen Lagoon entrance is undertaken primarily as a flood risk reduction action. As dredging of the main waterbody of Narrabeen Lagoon will not significantly impact flood levels it is not recommended for further investigation as part of this strategy.
Improvements to entrance clearance	Submissions were received which outlined a number of potential improvements to the existing entrance clearance management regime. These include changes or increases to the design footprint, for the clearance to be undertaken more regularly,	The draft Narrabeen Lagoon Entrance Management Strategy has considered this feedback and has recommended trialing more frequent, lower volume clearances to

	for traditional dredges to be used in lieu of excavators.	produce more prolonged open entrance conditions. In relation to the utilisation of traditional dredges, the Narrabeen Lagoon entrance clearance works currently underway are trialing a dredging approach in response to community feedback.
Suggested alternative options	A range of alternative entrance management options were suggested by the community. These included: • Installation of flood gates under Ocean Street bridge • Pumping of ocean water into Narrabeen Lagoon when the entrance is closed • Modifications to the beach and use of groyne structures • Underground pipelines at Mactier Street	The alternative options were reviewed by the consultants undertaking the study for whether they should be included in the assessment of long term management options. Options involving pumping of ocean water into the lagoon or installing pipelines under Mactier Street were found to be technically or economically unfeasible to achieve the desired outcome. Other options such as groynes would have unacceptable social and amenity impacts on Collaroy-Narrabeen Beach.
Improvements to Council's emergency response arrangements	A number of submissions were received which outlined potential improvements to Council's emergency response procedures including the mechanical opening of the lagoon. The suggestions included opening the lagoon at a lower trigger level or maintaining pilot channels or machinery at Narrabeen Lagoon.	The submissions have been considered and investigations were undertaken on opening Narrabeen Lagoon entrance at lower trigger levels. The results found that a lower trigger level may be successful if the conditions are optimum and this is recommended in the draft Strategy. The maintenance of a constant pilot channel or machinery stationed at Narrabeen Lagoon entrance was not found to be justified as there is sufficient response time to use external contractors.

The following pie graph shows all the themes and number of respondents who mentioned a theme in their response. Please note a number of individual responses were grouped into multiple themes.



Appendix 1 Verbatim community and stakeholder responses*

Part A: online submissions

Number	Submission
1	Dear Sir/Madam, I would to support the option for the mobile sand pumping. I've been a local resident for the last 24 years and a volunteer surf lifesaver for the last 15 years at North Narrabeen surf club, so I know the entrance to the lagoon quite well. The ebb tide flow option would be ugly and invasive, The half tide training walls would rapidly silt up and block the current deepest trench of the lagoon entrance, which is also the best snorkelling area in the lagoon. The area alongside the current wall at that point is also home to and provides shelter to most of the fish in the lowest part of the lagoon (hence the good snorkelling). If the water was flowing across the mid point in that area it would be a barren and featureless desert, The low flow pipes would look disgusting, rapidly block up and, critically, would not support marine life in that stretch. They definitely would not allow fish to swim in and out of the lagoon and would also end up heavily littered. They would also be really dangerous for swimmers and children in times of heavy rain and floods - there would be no escape point for anyone trapped in them as they'd work like a giant storm water drain! Thankfully you have ruled the break-wall out and the mobile sand pumping definitely looks like the best option. It works well in other parts of the country, has a minimal impact visually, keeps all the sand transporting trucks off the road, can target specific areas of sand build up, should come in at a reasonable cost, would keep the entrance clear and also retain the current trench alongside the road wall, home to most of the fish life and also the only decent snorkelling and swimming area in the whole lagoon.

Personal details have been redacted where possible. Spelling and grammatical errors have been amended only where misinterpretation or offence may be caused.

2	RE LONG-TERM OPTIONS Re Mobile Sand Pumping The Mobile Sand Pumping Option would require pumping sand over a distance greater than 2km., which is a long distance The pipeline would be a permanent installation, require booster stations and a mobile hopper connected to the end of the pipeline. If the pipeline was installed along the top of the existing foredune it would be a physical intrusion that would mar the beach area. If the pipeline was installed through a cut and cover operation along Ocean Street it would be out of sight but require extensive infrastructure. A particular concern is the impact of the mobile hopper and pipeline on the amenity, safety and recreational use of the beach. It is possible the disruption at Narrabeen Lagoon entrance would be ongoing due to the mobile hopper. Since 2015 there has been a greater accumulation of sand at the northern end of the Collaroy / Narrabeen Beach that would favour the Mobile Sand Pumping. However, the Beach rotation pattern could reverse this trend so that more sand is accumulated at the southern end of the beach (Collaroy Beach). If so, the pipeline would be less effective, as mechanical intervention would not be required to progressively transfer sand from North Narrabeen to Collaroy Beach. A pipeline on or near the foredune is likely to be vulnerable to coastal erosion or storm damage. Re Ebb-Tide Channel I support the trial of this option by forming temporary training walls with sand-filled geotextile bags. This would be a relatively inexpensive option and is worth trialling prior to a more expensive or permanent option, such as the 2km pipeline. The adverse recreational and aesthetic impacts of the Ebb-Tide Channel could be mitigated via design measures that provide better outcomes for recreation and aesthetic amenity. Re Installation of low flow pipes I do not support this option. The low flow pipes at the entrance of Manly Lagoon are an artificial intrusion at the Lagoon Entrance that spoil the natural amenity of Queenscliff Beach. The significant capital cost, together with the adverse impact on environment and aesthetics, hopefully will rule out this option.
3	The situation at the entrance to Narrabeen Lagoon would benefit from the introduction of management procedures which attempt to avoid short-term horizon emergency action. This is a guiding principle for any such situation. The current medium-term horizon procedures have to be continued with until long-term horizon, permanent management structures can be installed. I believe that the idea for a pipeline to pump sand and water away from the entrance and south to the Collaroy/Narrabeen beaches to be good one, and that a trial of 'training walls' to direct the water flow out of the lagoon is well worth trying.
4	The introductory video certainly answered most of our questions. Suggestion that similar videos could/should be run at local cinemas to get the "accurate" message on this natural phenemenon and reduce politicisation of this issue. Stress the high cost of alternate options trying to "tackle' a natural phenomenon. Keep updating information and please advise just what % of the local community actually view, read and responded to these managemnt options. Congratulations on a clear and factual presentation.

5	Narrabeen Lake covers approximately 2.2 square kilometers - agreed? There has been a t least 221 years of European faming, timber felling and agricultural pursuits within the run-off area to Narrabeen Lake - agreed? So, with 221 years of land clearing silt run-off into the lake at least half of the lake floor is covered with at least 500 millimeters of silt - agreed? The other half of the lake floor nearest the ocean, has, on average least one metre of extra sand - agreed? So what is preventing council from dredging the estimating one point seven million tonnes of sand, washing it and selling the clean sand to concrete companies? (Approx nett revenue $13.2m at current raw price). Alternatively, dredge and pump the sand in a controlled exercise 500 to 750 metres out into the ocean to form a flatter sea floor out from the coastline so big waves break further out to sea. (Similar to what was done at Copacabana Beach at Rio back in the thirties). From a health and safety point of view the balance of lake could be dredged of silt, pesticides, herbicides and fertilizer to prevent algal blooms that infest the waterwat.
6	I am responding to your request for submissions on Council's Narrabeen Lagoon Entrance Management Strategy. My main concern about the existing strategy is the significant delay that sometimes occurs before action is taken to reopen the lake. I suggest that peak use periods, such as school holidays, and the length of time that the lake has been closed ought to be major indicators for action to be taken to reopen the lake. In the past the lake has sometimes remained closed during school holidays. This has seriously detracted from the community's enjoyment of the lake and impacted upon the visitors to our area staying in the camping area. Any future strategy should include measures to ensure that the lake remains open during the holiday periods and is not closed for months at a time. I am not an expert on the practicalities of the proposed long term strategies but, from a lay perspective, I believe that the they do not improve at all on the system currently in place. All of the proposals would have a detrimental impact on the natural beauty of the region.
7	Hello, Well done council for considering this important issue and engaging with the public in this way. At this stage based on the options paper, the mobile sand pumping option seems the best option by far. I understand that this also operates successfully at Noosa Heads. No doubt there will be engineering challenges to be solved but intuitively the initial cost and disruption would be more than offset by the longer term benefits and savings. At the next stage it would be good to see more detail on environmental/ecological considerations.

8	I know that the lagoon mouth problem has been happening since the causeway was built for the first bridge. My family lived on Narrabeen Peninsula since before it was built. Do you have any feedback on the current management of Narrabeen Lagoon entrance during wet weather events? A. The operators of the diggers and the actions of the others involved cannot be faulted. They are professional and efficient. The big problem is that they are working on an unnatural situation caused by the blocking of the main channel of the lagoon by a road over the top of a man-made causeway. What other practices would you like to see the Council adopt? A. The Council needs to extend the bridge north not quite as far as where McKenzie Parade used to join Ocean Street but far enough to allow the main channel to run along its natural course unhindered by having to do a complete change of direction into an s bend thereby losing all its momentum and dropping suspended sand too soon. What are your thoughts on the periodic clearance works in the Narrabeen Lagoon entrance? A. Presently they are necessary but not sufficient to alleviate the risk of flooding to the overdeveloped floodplains and swamps in the Warriewood Valley. Do you have any feedback on how to improve the process or alternatives Council should consider? A. Re-route the main channel of the lagoon so it goes straight out to sea without being blocked and made to go in an S bend. Extend the bridge to allow the main channel to flow as a natural coastal system How do you want Narrabeen Lagoon entrance managed long-term? A. Opening as required to stop flooding the overdeveloped areas of the swamp and flood plain. What are the key considerations in determining which option to select? A. Taking a few of the caravan park sites back to allow the channel to flow as it did before someone thought they knew better than nature Working out how to extend the bridge without disturbing traffic flow along Ocean Street and Sydney Road. Alleviating pollution caused by removing the causeway and making sure none of it gets into the sea or blocks “Shark Alley”
9	I sm owner and resident at the lagoon waterfront [redacted] lagoon street. I have been living there for much more than 10 years and some of my neighbours have been living here for well in excess of that. From our experience with flood events and excessive rainfall periods combined with high tide events we respectfully request that the lagoon needs to be kept open whenever such events occur and well prior to it. Whenever the lagoon is open our houses are not threatened by heavy rainfalls and floods like recently. water raises but stays comfortably lower than our doorsteps to living rooms and patios towards the lagoon like last week. but when the lagoon is closed for too long and heavy rainfalls and tides occur, water raises in the lagoon too high and reaches our downstairs living rooms as it happened 1-2 years ago. it is crucial that you keep the lagoon open.
10	To get the entrance as close to the original path it took before 1974 (the storm)Perhaps working models of pre 74 and currently to get some kind of gauge as to which would be better and or idears could be tested before applied to the real deal .In essence the current version would be the control study. Expensive but what’s the option.
11	Build a large break wall and an artificial reef somewhere near narrabeen surf club

12	I believe the current process of allowing it to be 1 mtr above sea level is making the lake and lagoon worse and over time has caused this problem This needs to stop Every time the entrance is opened yes water goes out and some sand but more sand comes in causing a build up towards the bridge as water volume is not there as lake and lagoon has silted over If you go for a swim at the entrance when opened the sand is like quicksand More sand is coming in rather than out There is insufficient water flow due to the volume of sand in the lake and lagoon just look at the sand build up on the east and west side of Ocean street bridge If the sand in the lake and lagoon was removed therefore increasing water volume then when the entrance is opened and sand taken away not pushed up against the pool you may find the flushing theory would work I remember when the entrance where the rocks are at high tide being 2 Mtrs deep at least sailing with centre boards down This will be an expensive process but perhaps the sand can be sold. Maybe a cement company can do it for the sand Start dredging East and West side of bridge Then moving along creating a deep Chanel
13	I believe you should open the entrance of the lagoon as nature intended. Clear the entrance, take away all the sand at the mouth of the entrance, including the sand next to the surf club, which was man moved to there.. Bit expensive, but u will get good flow in and out of the lagoon. .cheers.
14	Council should seek, and heed, the advice of an experienced Coastal Engineer, such as Angus Gordon. Having been involved in a not dissimilar issue at Jimmy's Beach on the Mid North Coast, I would strongly recommend against using a Jet-Flow pump to shift the necessary sand. It is expensive to install, inflexible in its operation and expensive to operate, with significant establishment and disestablishment costs. It also requires a suitably qualified operator. The Mandurah alternative is far more practical, although it's designed to shift far greater volumes than required here, so it may prove to be expensive. In the long run, I suspect that a continuation of existing practices may prove to be the most cost-effective option on a DCF basis. It does require constant monitoring and the appropriate preventative action, as pointed out in the Options papers. In the end, the decision should rest on an analysis of the respective capital and operating costs.
15	Why don't you start, Dredgeing Narrabeen lake like they used to do years ago the lake is not very deep
16	I support a trial of an ebb tide channel and also the low flow pipes. For what it is worth, I'd also support a break breakwall. Would be interested in seeing an alternate video, an explainer, that provides a thorough explanation of historic decisions made, a timeline of events over the last century or so. Namely of the Narrabeen lagoon, the topography of the surrounding areas, and changes made, particularly the flood plain, changes to the entrance, and Pittwater Rd construction from Collaroy to Nth Narrabeen.
17	Like the idea of pumping the sand up the beach to keep the lagoon permanently open. Thank you for your time and energy to fix this once and for all.

18	Short Term - I support the investigation, and hopefully implementation, of more frequent mechanical opening of the entrance to deliver greater amenity/recreational benefits as well as longer duration tidal flows to support ecological processes and lagoon health. Medium Term - I support more frequent mechanical sediment removal and relocation (this will also help bolster, and hide, the seawalls existing and now under construction at South Narrabeen/Collaroy (terrible pointless short term responses - just bite the bullet and go for property buy-backs and parkland !) Long Term - I support sand pumping as the only viable option, and one with the greatest net benefit, However the pipeline should be located along Ocean Street (to be better protected against storm action) and I have concerns about the visual impacts of the pumping station shown on the dune near the lagoon entry (if this is to be a permanent or intrusive feature). Ebb tide rock training walls are not supported - due to their significant adverse recreational and aesthetic impacts (and I very much doubt that they will be effective). Low-flow pipes or a channel is definitely not supported - ugly and ineffectual. Breakwall - I wholeheartedly agree with not further considering this option - no, just no ! Thanks for the opportunity to comment. But not keen on the on-line options paper only approach (instead of a downloadable version) - as such an "ephemeral" document is not reassuring (or a good look) in terms of later accountability and transparency in decision-making.
19	As a resident for over 21 years I have watched the Lagoon levels rise and fall on a daily basis. In my view when the entrance is open there is very little tidal movement and little erosion around the waters edge. When closed it is a different matter. The level gradually rises and additional erosion occurs. eg along side the stormwater drain at Octavia Street where the lake edge has eroded some 750cm exposing old bottles, rusty metal and asbestos over the years. The drain is also a great measuring device for water levels. When the level reaches the top of the drain the lagoon should be opened. Recently the levels reached well over the top (over the adjacent seat concrete base) before quickly falling when Council opened the lagoon. In my opinion notwithstanding everything stated by you and your experts the best way you can prevent flooding and maintain a healthy lagoon environment is to keep the entrance open. If you keep it open we will not have repeats the flooding which occurred on 28/10/2013, 21/4/2015 and 5/6/2016

20	In any solution, the lake needs to be regarded as a living thing, not merely as an open stormwater drain. The estuary geography of the lake means that it requires an influx of saltwater to live and thrive and for this to happen an effective opening as well as channels to allow and promote tidal water flow both in and out of the lake need to be established and maintained. Bear in mind the mullet and prawn runs that require open access to the ocean from the lake in order to maintain health stocks of both and those higher up the food chain that rely on them, including the larger fish, pelicans, eagles and fisherman that the lake is famous for. Over the past 10-12 years, during the last 2 major clearance operations with the excavators and trucks clearing sand to both sides of the Ocean St bridge, the sand banks in both areas was flattened out with no channels re-established, therefore in effect chocking the lake and all but eliminating water influx into the lake during a rising tide. Water needs to flow into the lake on a rising tide and out on a falling tide to maintain its health and water quality. A reduced or restricted tidal flow in and out of the lake leaves the entrance susceptible to closure as sand is not being washed away from the entrance on a falling tide. In regards the medium term proposals, the mechanical breakout should include the excavation of a decent channel from the entrance, continue adjacent to the Ocean St rockwall, under the Ocean St bridge and along the southern bank of the lake west of the Ocean St bridge to a point near the end of Malcolm St opposite the Lake Park playground. That would promote tidal water flow both in and out of the lake. With the long term proposals, the Ebb tide training walls would be unnecessary if a channel was excavated in the sandflat in conjunction with the mechanical breakout at the entrance. The lake tried to do this itself in the last week during the flooding rains, so some mechanical assistance would easily achieve the desired result. The low flow pipes or channel would require too much rock excavation and I suspect would be close to the pool which is not ideal. The mobile sand pumping option seems ok, but a few points here include:- -the proposed nominal discharge points, are they on the beach or offshore -how temporary is the "temporary primary pumping station" and what's is visual impact -we assume the mobile hopper and connecting pipe will come and go as needed -running the discharge pipes south along the beach in the foredune. How will that go on the beach south of Goodwin St which was heavily eroded in the past few winter storms
21	We are lakefront residents at the end of Albemarle Street Narrabeen, we would like to compliment council for the way the Narrabeen Lagoon entrance was managed during the heavy March 2021 rainfall. The lagoon water rose over the banks however not to the extent that properties were flooded nd evacuations were required, as we have experienced many times before. We would like to see a 24 hour 7 day a week way of communicating with council during extreme weather events to offer feedback from local residents and also receive updates from council as to what action has been taken with opening up the lake entrance, perhaps this could take the form of a monitored Facebook group. We would also like council to consider the drainage around the lagoon, for example the base of Albemarle St the pine needles from neighbouring trees wash down the street straight into the drain at the end of the street where they block the drain and don't allow for the excess water to drain, causing more flooding issues. We report this continuously to council but it is never monitored enough to combat the problem when needed. Perhaps there is a another type of drainage system council could consider that would be more effective.
22	Council's management of Narrabeen Lagoon has been severely lacking for several years. Instances of flooding, pollution and algal blooms have become increasingly prevalent. The only way to maintain the good health of the lagoon for both the environment and residents is to to keep it permanently open to the sea. To do this Council should look into some more inexpensive and environmentally friendly ways to focus the ebb-tide, such that it consistently maintains an erosional channel.

23	Current Management: Thank goodness the Lagoon entrance was opened this weekend (20th March 2021). It is interesting that despite the torrent of water pouring out through the entrance the Lagoon levels are still high because there has been so much rain. I have watched and listened over the last 50 years and I am pleased that Council is heeding the scientists and engineers who have been studying our beaches and lagoons over that time and I do hope it continues. Periodic Clearance: This is obviously something that needs to be done and Collaroy/Narrabeen beach benefits as well. It does appear to be an ongoing battle though and 6,000 truck movements is a lot of noise and possibly wear and tear on the roads and the budget. Long term Management: There are some interesting ideas proposed. I am glad that the breakwall idea has been dropped. These man made interferences (like seawalls on the beaches) can bring unwanted consequences. This is why I support the idea of trialing an ebb tide flow system using sandbags first. As for piping the sand from the entrance to the beaches - if it really is a feasible option and doesn't need ugly infrastructure, then perhaps it is a good idea. I am not an expert on any of these matters but I am an interested and concerned resident. I appreciate the effort that Council makes to keep us all informed and the opportunity to have a say. Please continue this as well as listening to the experts.
24	I have been a resident of Nareen Pde, a particularly flood prone area, for more than 50 years. To the rear of my home is a narrow water course which runs into the nareen creek which runs into the lagoon system. There have been multiple floods to homes in our street over the 50 yrs and it is crucial that the lagoon entrance is open to allow water to escape during periods of heavy rainfall. However and IN ADDITION it is VITAL that the water courses and nareen creek are also kept clean of debris, silt, fallen trees and overgrowth to allow water flow to escape and not be blocked and build up causing unnecessary flooding of people's yards and homes. This attention to the waterways and creek is NOT occurring and there is a now permanent blockage of silt, undergrowth, weeds,debris etc which prevents free flow out to the lagoon. When I was a child(30-40years ago) the nareen creek was regularly cleaned/ dredged to keep it clear and flowing. At the least council should engage regular creek clearing if not dredging to improve flow and help safeguard properties from damaging flood waters. I believe this is required.
25	I know Councils is trying to find the answer to keeping the Entrance open, But unfortunately they continue to go down the wrong path. The last big mistake, was the massive sand hill they installed to stop the sand building up in the lake entrance. (and we can see how that worked) My family and I has lived in the same street for over 120 yrs and my grandfather worked on the first dredging operation in early 1900 and I have fished,surfed,sailed and swam in this prestige area all my life. Looking at the councils aerial photos it clearly shows, which way the the water wants to flow and the way that the sand builds up in an arc from the pool south to Collaroy. What I feel is needed (after years of observation) to keep the entrance open is to: 1: Remove the sand hill and restore it back to its original flat beach to the carpark (south side of Bridge) 2: Install Lge sand bag wall ,no higher than .5 m above top of the flat sand beach and stop at the maximum arc of sand at surf edge, A Line of deep water is shown on your aerial photo and should be followed with a sand bag wall as above. 3: Sand that has already been washed in should be retained and used to restore the sandy beach that was removed by previous council at the car park on the North western break wall. I have seen this sand bag wall process used at Cotton tree Qld and it has worked well and has not impacted on the environment or destroyed surf conditions . I am available to discuss my thoughts if council wishes.

26	Hi, I believe the short term solution is only a band- aid throughout the year and does not fix the problem with erosion, water level height/depth and does not improve conditions which may reduce the risk of flooding for residents living in and around flood prone areas such as Lake Park Road, Malcolm Street, Wellington Street, Devitt Street, Mactier Street & Pittwater Road both sides of the bridge. I feel the medium term solution would work best for everyone, if the lagoon was dredged on a yearly basis, In the past, when dredged the sand was depositied at Collaroy Beach and naturally with wind, swell direction and tide moved north protecting the residents and beaches at South Narrabeen, Narrabeen & North Narrabeen from damage and erosion. Further impacts to the the high amounts of sand in the lagoon have been the high amount of construction in the area and amounts of silt from building site entering the lagoon, the Surfrider foundations removal of the dune vegetation while good , depending on the wind, in particular if on shore deposits large amounts of sand in the lagoon. The long term solution of dredging similar to the Gold Coast would be ideal. I have seen recently, the erosion in areas of the lagoon, Middle & Deep Creek are full of sand. Areas at the back of Cromer Golf Course have seen rising water levels and the loss of trees. Near the boatshed Mactier, Ocean Street Briger and Lake Park the water height is extremely low. In Darius Avenue, a drain (outside [redacted] that constantly floods at the drop of minor rainfall. In 10 years I have been evacuated twice. The impact on residents is severe, this needs to be a priority for Council not only to improve water quality for recreation, improve the environment and for the health and safety of the residents. If there is another large environmental impact similar to 2009 & 2017 which is highly dependent on tides the impact of flooding could be significantly worse and endanger lives.
27	Hi I am a 50yr resident living near the lake and used the lake in many different ways over the years. I think the problem isn't at the lake's entry to the sea, the entire lake needs to be part of the approach to maintaining a healthy waterway. Fundamentally the volume of water contained has been reduced due to mainly silt & run off from developments & natural influences from surrounding areas feeding into the lake. Deep Creek was never really deep but now is very shallow. The flow of Deep & Middle Creek is incredibly restricted. My father commuted along the Wakehurst Parkway every day for 25+ years through the 70s, 80s & 90s without many flood events restricting the flow of traffic. It is now happening 3-5 times a year where we get a few days rain. The lake still floods when the lake is open. I learnt how to sail dinghies & windsurfers with centre boards (removable keels) on the lake. That pastime is not possible on the larger portions of the lake now. I stopped windsurfing on the lake because of how shallow is was getting. I know of three life changing spinal cord injuries from windsurfing of the lake. I learnt how to fish in the creeks & deeper sections of the lake. There was once a time when high powered speed boats would tow water skiers on the western portion of the lake. The reason the lake gets flooded after just a few days of rain is because volume of water & flow of water is just not enough to store & disperse the rain events. I agree the the outlet needs attention but you have to consider the entire waterway.
28	On viewing the short video it seems the Council is doing what they can. In the long term it is like Collaroy beach and houses should not have been built on the foreshore of either area. It would be best to acquire these properties and not be so controlled by the ocean, drainage and weather. As this would be so expensive and elevated roads would need to be put in place it seems the best thing is to continue as the Council is doing. (Collaroy beach houses should have been acquired, removed and dunes stabilised
29	1.We recommend the immediate purchase of an excavator to be standing by at all times to open the lagoon entrance in case of flooding.. 2. Need to appoint a person to the council able to predict possible flooding because of a high tide and high rainfall predicted at the SAME time..then opening up the entrance BEFORE the build up of lake water.. Our home has been badly flooded twice ..once in 2016 and again in 2020..The repercussions and expense involved months of restoring woodwork, replacing electrical items like fridges and dishwasher and our garden.... We know these could have been prevented as on BOTH occasions as soon as the entrance to the lagoon was opened later in the day, the water rushed out of the house like a river ...leaving us with

	a disaster area..This indicates that the council was far too late with opening up the entrance.. 3...Earlier this year another high tide with heavy rainfall caused complete flooding of the cul-de-sac at the bottom of Robertson Road ... As we were becoming really concerned re another flooding of our home, I rang the council. ...I was told that they were getting a bulldozer in to open up the entrance ASAP.....I asked why this could not have been requested much earlier but he didn't know....SURELY someone should be taking responsibility for to ensure the opening is cleared when or before it is likely to be required... 4. Flooding of our lagoon has caused a great deal of erosion of its banks and soil resulting in many beautiful trees being lost....Also many of the footpaths already need repairing along the walkways ..eg already near the Boatshed....Eventually the footpaths will need reinforcement or replacement at more cost .. Surely prevention of flooding is reliant on prediction of the tides and expected rainfall....If we as elderly seniors can do this then surely the council could employ someone responsible to excavate the entrance before flooding occurs.. 5.. Please consider this option as many of others involves a great expense..
30	Ref 2020/683379 Narrabeen Lake: I feel one of the easest way to help with the problem of flooding would be to have a permant small electric powered dredge pumping silt that has washed into the lake over the years of from develpment around it. By deeping it would allow more water volume and the sand from the entrance could be pumped back onto the beach.
31	re Narrabeen Lagoon Entrance Management Strategy. I am concerned about the water quality in the lagoon due to lack of care of the feeder streams, canals etc. The lagoon is a wonderful asset for the Northern Beaches and is popular for water activities such as swimming , fishing and boating. I would hesitate to eat anything caught in the lake and am also concerned about the potential for swimmers both human and canine(see dog parks) contracting bacterial and viral diseases etc. Surely part of the plan to maintain this unique environment should also consider maintaining the feeder creeks to maintain life and prevent pollution of the lagoon itself. Nareen Creek , east of Narroy Road used to be cleared regularly by Pittwater Council, however, it had been ignored by the NBC until very recently when a somewhat haphazard attempt to remove weed and improve flow was made. Unfortunately the upper reaches have not been touched, apart from the occasional spraying of glyphosate which leads to piles of dead weed blocking the creek and poisoning the water. Amphibians in particular are adversely affected by such a poison let alone reptiles, fish and water birds. Nareen Creek is a unique environment for amphibians, reptiles and birds. I have myself rescued a long necked turtle that got flooded out last year onto the main road. Unfortunately during droughts the it becomes a toxic swamp with algae limiting the oxygen levels. it needs to be dredged to remove the long standing weed, fallen trees and other rubbish which result in flooding of the local area. I understand that the creek was developed when the Nareen Park originally a swamp was drained and the land level raised with junk from the tip ,some of which was toxic resulting in a toxic sludge and weeds that are difficult to recycle. Surely some effort should be made to return this creek to the condition it was some years ago when Pittwater Council made a concerted effort to clean it up and improve water quality and flow. Necessary in order to reduce flooding and contaminating our lagoon. I would certainly like to see the lagoon open to the ocean to improve water quality and facilities, however, would also like to see a greater effort to improve the water quality of all the sources running into the lake. Thank you for allowing me to address my concerns.

32	Periodic opening and pehaps more regular (every 3 yrs) dredging would seem like the best way forward. Permanent pipes or pumping will severely impact the amenity, as well as being a safety issue.
33	Opening the Lagoon permanently is a great idea and well done!!! It is great for marine life, bird life, mammals and related wildlife. It is also great for tourists and residents and helps to minimise flooding which is a real risk for residents. Now if NBC is going to be fair, equitable and really a local government it MUST do the same for the Manly Lagoon at Queenscliff - it MUST be permanently opened up wider to stop the pollution build up, marine life degradation and most importantly - reduce the high flood risk for all the residents !!! Open up Manly lagoon NOW!!
34	Could you please permanently open the lagoon entrance and dredge the lagoon to a suitable depth so that we can actually use it. Stop fluffing around with temporary solutions and worrying about the short term water quality affect at the beach.
35	Dear Narrabeen Lagoon Entrance Management Strategy Team. Firstly, thank you for the explanatory video re the behavior sand at the entrance to the lagoon. Well done. I'm contacting you with a question. Quite apart from the important issues about effectively managing potential flooding issues. What is the current thinking re dredging the further reaches of the lagoon? As I recall, several years ago there were serious plans to dredge the lagoon. Why was the proposal shelved? While I'm absolutely NOT suggesting a return to the water-skiing of the 70's. (God forbid.) I AM concerned about the lake gradually silting-up. I've lived in the area for over 30 years and have seen changes to that effect. I recall that during the discussions about dredging, some of the experts foresaw that without dredging - the lagoon would gradually silt-up. Apparently, it would in turn, eventually become a swamp and then decades later cease to be a waterway. I look forward to your response.
36	The sand dune north of the surfclub needs to go to allow the lagoon to naturally shift entrances as it did prior to human interference. When the excavators dig at the entrance the dune just supplies more sand via slipping. Have you tried digging a hole at the beach? The surrounding sand just refills the hole. I would also like to see the artificial reef at south narrabeen revisited.
37	I believe that break walls at regular intervals should be constructed along the beach between Collaroy and North to prevent the rapid north migration of sand along the beach. These are the practices would you like to see Council adopt. The periodic clearance works in Narrabeen Lagoon entrance is essential to reduce flooding of properties around the perimeter of Narrabeen Lagoon. This is how I want Narrabeen Lagoon entrance managed long-term and the key considerations in determining which option to select include 1. the amount of sand that is required to be removed 2. the frequency between sand removal intervals 3. the present cost and future costs

38	Firstly thank you for the opportunity to make a submission. The info provided in the proposal was very enlightening and shows the complexity of opening the lake. The policy of opening when the lake is high and heavy rain is predicted (as is happening, I believe, this week) is a great step. I am not sure this was done in the flooding last February. The issue raised is the sand from the beach daming the lake. What if you created a concrete open channel between the lake and sea that could always be kept open using a bobcat.... don't laugh I am only a novice!!!!
39	Hi Hi believe the Dune that was put in front of the entrance after the 74 storm needs to be removed and the first 500 m of the lake entrance requires to be dredged so that the flow to the back of the lake can be kept.
40	As the in going tide, deposits more sand than the out going, [except when sufficient rain removes sand, as it increases the out going tide] The obvious answer is to pump seawater into the lake with the in coming tide therefore increasing the sand removal as it goes out. This could be worked out to equal the in coming tide or more if necessary. Pumping water would be cheaper than pumping sand and could be turned off when not needed. The S bend created by building the sandhill could also be removed by shortening the sandhill by at least one third, if not half. This would make the flow more direct and powerfull. An artificial reef could be constructed at the narrabeen gardens using sand bags slowing sand movement along the beach and help stop erosion. We need to think outside the box.
41	Hi I've had a look at the different options and it looks like a difficult problem to solve. It may be worth considering flood proofing the edges of the lagoon so that if the lagoon is closed it will not have as significant an impact. I'm glad to see that the breakwall has been disregarded. As a keen and frequent surfer at North Narrabeen I would not like to see any solution that damages the surf break, This is an iconic surf break that is not just know in Australia but around the world. With the WSL tour holding an event at North Narrabeen this year the profile will only continue to be raised. Any solution that is adopted need to protect and even enhance the surfing characteristics of North Narrabeen.
42	I am of the opinion that a pumping station situated amongst the dunes and only operating mid week would be a great option. Also I have had thoughts that dual pipes extended to the rock shelf with appropriate safety sceening would allow water movement without sand entry to the lake and the excess sand in the lake itself could be moved to create more dunes and beach.
43	Hi, The entrance to the lake was re directed by council around 20 years ago to run along the edge of the rock wall to then meet the ocean close to the very Nth corner of the beach near the pool. This has lead to the lake closing much more frequently, because the rock shelf which the water has to flow over is the shallowest at that part of the beach, therefore the water can not create a trench which is deeper than just a few inches on the low tide, so a little bit of sand will easily block the entrance. Prior to the change of water flow, which I mentioned the water used to flow out next to the sand dune. The flow would hug the sand dune side of the lake area east of the bridge and flow to the ocean next to the dune. This would allow the water flow through the entrance to be deeper because the rock shelf on the bottom sits lower there and therefore the entrance used to close up much less frequently. All the would need to happen is redirect the flow of water along the back of the sand dune and open the entrance to the ocean close to the dune next to time allow the water to dig out a deeper channel and now become blocked so easily. The entrance always closed from time to time in my lifetime, but it was much less frequent for the 2 decades I've been around, prior to the changes made when the water flow was redirected to hug

	the stone wall. It's a simple change to redirect it back to how it was previously and will allow the water to flow more freely, rather than over the shallowest part of the rock shelf on the bottom.
44	Long Term Solution. This is a bit of a different concept to those mentioned by the council and others. Although , it does have a slight similarity to the "low ebb flow pipe" at entrance. A look at the lake on Google Earth shows that about at Mactier Street the peninsula is almost at it's minimum width separating the ocean from the lake. A large underground pipe connecting the lake to the ocean could be constructed . If it had a backflow restrictor fitted high tide water could enter the lake via this pipe. As the tide goes out , the backflow restrictor stops the water going back to the ocean via the pipe. The only outflow option the lake would have is via the entrance. The extra water flowing out would help keep the opening from clogging.
45	Short Term management: As stated by the council , mechanical opening of the lake is carried out when the water height reaches 1.2 to 1.3 m above sea level. I think this level is too high. I live down the street from the Lakepark Road boat ramp where there is a council water height gauge. I look at the gauge on a fairly regular basis. About 3 years ago there was substantial flooding of North Narrabeen caused by a very heavy rain event. At that time , the lake had been closed for months. The water height was .9 m . Heavy rains occurred (as predicted by the weather bureau) . The council waited for the 1.2 water height and the lake was mechanically opened. Unfortunately the lake opening takes about a day to fully establish itself. During that time the lake level rose and flooding occurred causing much damage. Had the lake been opened and reduced the .9 m to .3 or .6 m the flooding probably would not of occurred or flooding would have been to a less extent. Opening the lake at .9 m may not create the "perfect" opening but the worst outcome is that it has to be reopened again. The cost of mechanical opening of the lake is nothing compared to the cost and danger of a flood.
46	1) The actual lagoon should be dredged annually to provide safe channels for boating etc - the lagoon has generally gotten shallower overall over the last 40 years that I have been a resident 2) The entrance to lagoon would then only need to be manually opened by tractor(s) as & when deemed appropriate. 3) The dredged (and dug out #2) sand can be repurposed on DY - Collaroy - Sth Narrabeen beaches.
47	I have lived in Warringah all my life and directly on the lake for 20 years. The council seems to not be taking into account 1970s wholesale changes to the entrance position (now blocked by the North Narrabeen SLSC sandhill 'extension'); and the massive increase in siltation due to opening up housing areas in the catchment such as Red Hill. Short-term - Clearly the water levels being used must be adjusted down so as to not leave water sitting too high in & around the lake. As your options paper itself states "water levels are noticeably high and can cause alarm in the community". This should not happen and causes flooding to paths , gardens and housing at the current high levels. The only time I have seen 'true' flooding was since then in June 2016 and Feb 2020. The main reason for that I believe was teh lake was closed and sitting at way too high a level. If had been drained EARLIER than on the day (!) of the well-forecast storm events, the lake could have been able to take a greater rain 'load'. Medium-term - The clearances are becoming required too frequently since the 2015 rotation meaning too much cost for residents. Although absolutely necessary to clarify what is what of the peninsula's greatest tourist attractions, a more permanent solution must be found. Long-term: Having read the options paper, and briefly researched the options, I believe the sand-pumping stations must be the way to go - for cost-benefit and aesthetics, let alone a good solution.
48	I have been a Narrabeen resident and surfer for over 25 years and have listened to the various points of view regarding the management of the lake entrance during that time,and I've been present when most openings have taken place . The transport of sand to Collaroy every few years at considerable cost has been a necessary undertaking--my property is one that flooded in 2016 due a combination of factors from king tides to large swells and the lake not being opened early enough. Due to a prominence of south swells and the depth of the rock shelf we will continue to see the entrance closed up on a regular basis, so I believe it would be in our best interests (and for the continued good health of the lagoon) if the sand were to be pumped down to Collaroy via pipes through the sand dune , and this could be done when considered necessary without reliance on copious amounts of rain to keep the channel clear. With climate change influencing our coastal waters this is not a problem that will get better on it's own,and the sooner we address it the

	better.Can I also say I thought the video was excellent and summed up the situation overall very well
49	The major dredging works that occur every 4 years is a huge waste of our Council Rates. The entrance always closes up anyway. Just open the lagoon up when it closes. It shouldnt even take 1 day to do- more like a couple of hours with a single excavator. This is far wiser - cost saving & minimal (if at all) disruption.
50	The major floods in the area were because the lake was opened too late. I strongly believe the lake should be always kept open.
51	None of the proposed long term solutions contain sufficient information to enable effective feedback by the community. The traffic light system used for key aspects of each solution has no supporting information to show the basis for setting the traffic light colour for that particular aspect of the solution. Based on initial searches and reading relating to the potential effects of sand pumping, the current council view in this presentation that the environmental impact is low does not seem to align with community concerns raised in Mandurah WA with respect to the effects of sand pumping there. See news article Mandurah Mail newspaper dated February 5 2019 by Kaylee Meerton. The current council practices appear to work albeit they are expensive and don't appeal to everybody. From the previous council flood mitigation workshops it became evident that a long term solution was difficult implement due to the inadequate development practices surrounding the lagoon over many many decades. That being said a long term solution should not be dismissed. As a user of the lagoon I have noticed over recent years a continuing build up of sediment across the entire expanse of the lagoon to the point that previous parts of the lagoon that were once deep are now very shallow not just near the entrance but also at far ends of the lagoon. Has there been any consideration into the impact the changes in depth of the lagoon are also contributing to the problems at the entrance. The other issue raised by the council staff with respect to the causes adding to the closure of the lagoon entrance was the obstruction of natural outflow from the lagoon caused by the Ocean Street bridge with its artificial break wall. Has consideration been given to implementing changes to this structure to provide a more direct path for outflow from the lagoon which may assist the natural process of sand clearing under the right conditions. Modern bridge building techniques should be able to do away with the need for such a large rock wall on the northern end of the bridge. I appreciate this problem is very complex and requires careful study over a long period to find the best overall solution that balances environmental impacts, flood mitigation and cost. A significant amount of information is required by the community, if the community is to provide effective feedback on any long term solution.
52	I live locally at the end of lagoon street and like many people walk the lake regularly and enjoy kayaking and fishing, I am in the fortunate position to observe the lake day in day out and by doing so I gain a good insight into the health and issues impacting the lake. In my view I would like council to spend more time on the "medium term options described" and in doing so pay particular attention to the frequency of the medium term options and extent of the medium term options. By this I mean that more time and more equipment will be required in order to achieve an effective removal of sand to the east and west of the Ocean street bridge. The failure to remove sand adequately or delays in medium term options has meant that the sand build up to the west of the bridge is now greater than at anytime previously in history and the impact of this causes reduced flow, damage to weed beds habitat on south western side of the lake is large and the lake as become more susceptible to flooding and poor water quality. I would urge council when undertaking the next sand removal that their is a concentrated effort on both the eastern and western side of the ocean street bridge and that the depth and scale of the excavation in increased and extended. What this achieves will be a reduction (for a period of the time) reduction in the need for short term measures, it will maintain habitat without losing more weed beds, it will promote flow in the lake, improve water quality, improve aesthetics once the work is undertaken and improve health for both marine life and water users. I would like to discuss this further with council officers and I am flexible as to whether to meet at council offices or on site. I feel passionate about this subject and I applaud council for giving residents the opportunity to input thoughts.
53	There must be a better way to keep the entrance open then the present policy of removing sand by excavators. Perhaps a breakwater could be built on the southern side of the entrance to stop the sand moving north and closing the entrance. The water course should be straightened to what it was prior to the bridge being built. Hopefully these measures will help to reduce the future ongoing costs and prevent flooding along the banks.

54	I am a long term resident of the area going back beyond Council's 50 years management of the lake..my recollection is of a healthy lake system which was open more frequently than now. I would like to know if council 's old records show a similar build up in the "old days". If not, does the build up of sand in the Western end of the lake (due to surrounding residential development) contribute in any way to what's happening at the entrance.If that can be established, dredging to the west may be helpful. I also question whether dumping the spoil a kilometre away doesn't cause this aggregation to occur much more frequently. Your Lake Management Plan seems centred on flooding concerns...not a word on the health of the lake...SURELY more frequent openings would help and maybe dredging the western end would provide a larger, deeper volume of water, that would give more regular water temperatures (particularly in summer) and a better aquatic environment.
55	As a long term resident of Narrabeen over the years I've become more and more aware of the the importance of our lagoon which is so so beautiful when she's in full flight/flow I believe it's offers so much more to the community when open whether it be recreationally or environmentally. The risks when closed can be very scary for our community that have to live with the constant threat of flooding, and the damage it causes. When a child I recall the dredging in multiple locations which assisted in the flow of fresh ocean water to the lagoon which has left a life time of memories, but when closed the smell the colour of the water was horrible and pelican itch is horrendous. I am and will always support the lagoon being opened as much as possible and fully support the possible sand pumping which is very similar to which is conducted on the far north coast of NSW and other locations throughout Australia
56	Go with the sand pumping to Collaroy. On the Gold Coast at the Spit they run a pumping facility from one side of the break wall to the other - being South Stradbroke Island, they also do it from south of the Tweed river to Greenmount. Pipes go in permanently (hidden/buried) along the dunes to south Collaroy and are turned on intermittently
57	Re: How do you want Narrabeen Lagoon entrance managed long-term? What are the key considerations in determining which option to select? As a long term resident of Narrabeen, 35 years and an active surfer and participant in the North Narrabeen boardriders club, I would like to say the the direction of the long term sand pumping to keep the lagoon open and replenish the sand on Collaroy beach is the favoured option from what council is considering. Key Considerations: 1. Keeping the entrance open as much as possible for all lagoon recreational activities 2. Keeping the surfing banks in the best possible form for this unique natural surfing resource Thank you for respecting this great surfing beach and ditching any prospect of an entrance break wall. This would prove disastrous for the unique natural resource.
58	Thank you for the opportunity to respond - I do not support building a breakwall (I know you've discounted the option), nor creating the ebb tide channel nor the low flow pipe - these options would significantly interrupt how people use the lagoon entry at the moment. I can support the mobile sand pumping option on the proviso that the permanent pipe is buried and does not run across the top of the dunes. I actually do not support protecting the buildings in Collaroy / Narrabeen. They should never have been built on the sand dune. I would prefer Council to use it's funds to buy back these properties, demolish them and restore the sand dune. Once again thank you for the opportunity to provide feedback.
59	We think there were less problems many years ago when the lakes entrance was more of a straight line from the bridge to the ocean rather than curving around. There is a sand hill in the way now that could be moved over. Maybe this will give better flow with less blockages,

60	First Council must accept that the current setup from the ocean st bridge to the entrance is a man made problem and any environmental concerns should take into consideration that we are not altering a natural environment if we make major changes. I believe 2 issues are causing most of the blocking of the lagoon they are 1, the rock wall on the nth side attempts to direct the flow 90 degrees thus slowing the water flow and creating a great eddy in the central basin east of the bridge where sand builds up and slowly creeps nth east until the lagoon closes. 2, the dune east of the bridge is man made and provides an un natural build up of sand that also creeps nth and blocks the entrance. During the medium term clearance programmes the accuracy of the excavator operators has varied enormously and has at times looked random and inconsistent leaving large holes next to untouched areas which also slows flow and creates eddys. When the openings occur the sand is often piled metres high directly next to the opening on both sides almost inviting an immediate re closure. if it was carted away it would lengthen the time it stays open. Often when a major clearance is finished little attention seems to be given to the width of the opening which can be the difference between months or years. If the large dune was reduced to the minimum required to offer protection and graded to the sth , there would not be a ready supply to move nth and block it. This dune has grown many many times larger than when it was constructed and is many times larger than is required and in my opinion IS the problem. I would like to offer a potential solution that could be trialled very easily and with minimum cost and may negate the need for the more expensive solutions. next time a major clearance is done as well as the removal of sand you could relocate sand from the area nth east of bridge by dragging or pushing it east thus widening the channel and increasing the flow that will itself remove sand from the entrance. Also clear the sand from under the bridge all the way along its length and create more flow to move sand. rather than counting cubic metres or truck loads to measure effectiveness, monitor the excavator operators to maximise the operations success by accuracy of removal. Once an operation is complete you would only need minimal sand re location from the sth side of entrance by very small plant equipment such as a bobcat/ small loader etc or even councils own beach rake approx 100m to the sth, sth west to prevent build up. Re train councils tractor operator?? to operate a bobcat on inclement days when ovals can not be mowed and no work is done. This is an easy cost effective alternative to the major works up for discussion. When the rock pool is cleaned of sand it is often dumped on the nth side of lagoon and adds to the clogging. I have been in and out and across the entrance as a local surfer, swimmer and Councils Lifeguard on Nth Narrabeen Beach for over 45 yrs and feel very strongly that the dune on sth side should be reduced massively directly sth of entrance and less so as you head sth and most of the problems will be reduced. In summary Open and clear the sand as normal on next major operation with an emphasis on accuracy and widening. Following that, implement a regular entrance maintenance programme to stop build up. Make the maintenance a priority and the length of time between major clearances will become further apart. Change the focus from major costly operations to targeted intelligent and informed maintenance which will over time be a much cheaper and effective way to manage the Lagoon.

61	Firstly, it was a revelation to look at and listen to the council video on the opening and closing of the Narrabeen Lagoon icoll. I was heartened to hear this and to know that science determines the opening and closing of the lagoon, not just upset property owners fearful of flooding, who lobby local councillors into pressuring Council to open the entrance. You mention that the environmental health of the Lagoon is important and as such feeds into the equation of when to open the Lagoon too. My concerns are:- *water quality of the lagoon and the causes contributing to this! Are the causes being identified and addressed within the whole lagoon catchment - not just having an open the lagoon mentallity to this problem . What is going on in the catchment to pollute the lagoon and sometimes even give it an odour? Does engineering talk to the environmental department about all of this?. * my second concern is about the salinity of the Lagoon . I am sure that there must be a connection between salinity in the lagoon, fish stock and types of fish etc and the magnificent occurrence of birdlife in the lagoon catchment with a particular focus of mine on the black swan colony and pelicans who call the lagoon, home. Obviously too pollution levels will affect the occurrence of these birds. So have studies been done on what conditions favour the occurrence of these large, iconic birds and does this information feed into the frequency of lagoon opening events??? Perhaps the one metre rule is too low? A lagoon by definition opens to the ocean periodically and is not a lake . It is a sensitive total environment that needs to be managed well when sitting in an urban area. Obviously there are demands on this management plan which have to balance flooding risks, passive and active recreation and the delicate natural ecosystem. The frequency of opening and closing of the lagoon should not just be determined by the flood risk . I would like to see the management of this enjoy a wider scope and be the result of engineering and the environment and recreation consulting with each other and learning from each other . PS occasionally boats with outboard motors and manned by usually younger males, speed through the lagoon on the beach side. These sorts of activities along with unleashed dogs on the foreshores should be stopped promptly because of the detrimental effect they have on Lagoon shoreline, fauna and birdlife .
62	The problem created many years ago was building the bridge. Unfortunately the opening underneath the bridge needed to be a whole lot wider and until this is rectified the lagoon entrance is always going to have blockage problem. The sand dune built in front of the bridge by man has compounded the problem but unfortunately until the bridge entrance is wider it probably has to be left as it is. If the opening was wider natural process at the lagoon entrance would work properly. Consideration should be given also a bit of dredging further inside the lagoon as this may assist in water quality. (don't forget man has compounded the silting up of the lagoon)
63	Can the channels that run under the bridges at Ocean St and Pittwater Rds be increased to allow better flow of water to the Ocean? This would prevent water backing up at these bottle necks when there is risk of flooding
64	Thank you for councils commitment and service regarding maintaince of lagoon entrance. as a former resident of Ocean St North narrabeen work has been done with consideration and minimally disruptive. maybe divert traffic off ocean st at rats park onto Pittwater Rd north narrabeen residents to use lagoon st during sand movement. Liked the trial of moving sand actually on the beach using small bulldozers not sure how effective it was. glad not considering pipe as at queenscliff. Was concerned by flooding due to big storms and tides 2016 ??? when the Lake was closed and filthy (maybe not scheduled for another yr ??? but it needed opening prior to excessive rain and storms, easy to say in hindsight and not knowing logistics planning required for sand excavation. Pro active communication evacuation alert storm tidal flooding last year and reading council info given me more understanding. Praise for all you do for us to enjoy preserve protect maintain our precious local natural environment.

65	Hi, I don't live in the northern beaches, but I did grow up there, and own a property in Bilgola .It's interesting that you seem to be having similar issues with Narrabeen Lake Entrance to those we have up here on the mid north coast with Lake Cathie. I'm not sure if the issues are exactly the same, but it seems that in periods of drought, lake entrances tend to silt up, and people living around the lake start to complain about water quality. Attempts here to open the lake when the lake level is low have generally failed ie the sea soon seals the dredged entrance up. Flooding is less of a problem here as the lake is smaller, but maybe it is more of a problem in Narrabeen because there are 2 large creeks with big catchments feeding into the lake, and maybe there has been more development at lower levels around the lake (and the ongoing problems with Wakehurst Parkway.) The real problem with both of these lake systems is a history of inappropriate development around the lakes which doesn't allow them to regulate themselves in a natural way (a similar problem in a way to the coastal erosion issue, where the problem is excessive development too close to the sea.) If you want to retain the natural features ie lake systems and beaches for all to enjoy into the future, then planned retreat and restoration to as close to the original, natural features as possible, is really the only way, expensive and locally unpopular as it would be, with landholders being appropriately compensated, given they were allowed to build etc in inappropriate places. Another example is Sand or Sandy Point at Palm Beach. I can recall when there was a continuous sandy beach all the way around, with only modest houses set back from the beach. Successive attempts by landholders to retain their own properties have resulted in increasing erosion of the public asset in order to preserve the private land. There, that's my 2 cents worth
66	In the long term, the problems of managing Narrabeen ICOLL entrance must be viewed more broadly. The entrance is a small part of a larger dynamic water system encompassing all of Narrabeen Lakes system, including tributaries, together with the coastal area extending from North Narrabeen to Collaroy beaches. Narrabeen Lagoon is not a natural system. It has been modified to allow for human occupation and movement, and permanent changes have been forced on the lagoon as a result. Some of these are permanent retaining walls; another is the enforced re-location of the entrance to the extreme north end of the beach, north of its natural and historic location some distance further south. It's questionable whether, left to itself, the entrance would move back to its original more southerly position, as existing permanent retaining walls may discourage this. I don't know whether Council's records extend back to the time when the entrance was in its historical position, and what the frequency of closure was for an entrance in that position. But I imagine that possibly in that position the entrance would have been naturally disposed to stay open for longer periods, perhaps even stay open nearly all the time, because a deep entrance was available owing to the absence of the shallow rock floor which obstructs the present entrance position. I wonder whether Council has given any serious thought to the benefits of moving the entrance back to where nature put it? Or has the subject perhaps been avoided like the plague because its effects on the iconic North Narrabeen surf break may be catastrophic. But does anyone even know what would happen? It might even improve the break. Also, the opportunity for a deep entrance would enhance the effects of tidal scouring of the entrance channel, particularly during spring tides, both flood and ebb. Other factors affecting the entrance must include the silted state of the lagoon, particularly but not only in its main expanses west of the Pittwater Road crossing. The former Warringah Council recently examined the problem, but on terms that appeared from the outset bound to render dredging impossible: the central basis of the study required that controlled commercial dredging would not be permitted, and that the costs of dredging must be from the public purse. Blind Freddie could see from Day 1 that the study would find dredging uneconomic - and it did. If NBC would open its mind, commercial dredging under controlled and supervised conditions could permit economic improvement of water flows in the upper lagoon, without necessarily triggering destruction of the all-important sea grass beds. And detailed consideration may establish ways in which dredging, perhaps between the two main bridges, could benefit water flows in the entrance. The film clip makes the point that sand dredged when the entrance is opened is distributed elsewhere on the beach - no doubt at considerable expense. The vexed question of coastal erosion is being managed simply by replacing the missing sand. Is that responsible management? It becomes a recurring expenditure, at varied intervals; and emergencies happen with little warning - and under conditions where it's impossible to start replacing the lost sand until the cause of the sand loss abates. I have seen permanent stone groynes erected on long stretches of beach like

	ours, in Queensland, on the Gold Coast. Set about 600 metres apart, they work well, the beach stays put - and so do the houses. I have never seen groynes even mentioned in discussion of beach erosion in NSW. Do they spoil the surf break too? They don't seem to have that problem in Queensland. The issue is not just the Narrabeen Lagoon Entrance: it is all of the lagoon, and the coastline adjacent to the entrance. I urge people far better qualified than I am to open their eyes and look at a bigger picture. Narrabeen Lagoon has been fiddled with over the last 100 years, generally with some benefits but some unforeseen effects too. It needs fine tuning by people with both imagination and ingenuity. Don't follow the text-book solution: look for economical and original solutions. And for heaven's sake, get away from this crazy business of trucking millions of tons of sand from A to B only to see it washed away again.
67	Of those options the low flow pipes seem the better. In my opinion they should dredge around Jamieson Park as they used to.
68	The long term mobile pumping of sand seems okay if it more cost effective than the current trucking methodology. I do not like the other two options as they will likely have significant long term impacts. In the 10years living at Narrabeen I haven't seen the water quality in the lake deteriorate when the entrance is closed. Is this a myth or does data exist? I would like to see the homes raised and foreshore assets protected rather open the entrance regularly.
69	Please keep Narrabeen Lagoon open at all times. I have lived on the Lagoon edge for 27 years and the only time it floods is if the lagoon is closed, as soon as it is opened the water drains away. I also feel the water is cleaner when it is tidal and children swim close to the Woolworths Car Park. A high level of rain water could cause pollution, and possibly contain fecal matter from run off water.
70	hello Environment management in the last two years I noticed that the Mullet Creek which runs into the lagoon underneath Pittwater Road, has been a brownish colour and only a few fish can be seen now and one or two ducks, where as there used to be hundreds of fish and dozens of ducks enjoying their environment...my impression is that lots of polutant is flowing into Mullet Creek from it's source and a large part of the lagoon is hence discoloured when it used to be crystal clear...one reason is of course the lagoon outlet is most often blocked by sand and should be kept open at all times... surely it would NOT cost a huge amount for a grader to move the washed-in sand once a week or how often it needs to be done.....I imagine that " once a year sand clearing " would cost lots more with countless truck loads and sand scooping machines operating there for 2 weeks or more...we need crystal clear water in the creeks and lagoon...voila !
71	I am impressed by the way the NBC is approaching this issue. I learned a great deal from the "explainer" video, such that I appreciate that this is a complex issue best addressed by the relevant technical experts in consultation with those members of the community who re immediately affected and the NBC itself. My only comment would be as to how the proposed solution(s) will relate to the wider lagoon management issues such as seagrass health and maintaining the public amenity of the lagoon.
72	Whilst we are not exposed to flooding risk at the perimeter of the lagoon, we have an interest in flood mitigation more generally. In the rain event in 2016, water prevented access to Gondola Road at Pittwater Road and water flooded Gondola road up to the intersection with Venetian Road. I assume that the source of the buildup was stormwater and not flood from the lagoon. The option papers are excellent and clearly describe the various options under consideration. It is interesting to learn that the natural state of the lagoon mouth is closed and natural opening is the exception. Our preference is for more frequent removal of sand from the lagoon entrance and depositing of sand on Narrabeen-Collaroy beaches. Not only does this replenish sand on those beaches, it deepens the lagoon near its entrance providing some protection against flood

73	We live near the Lagoon and only ever swim on an incoming tide when the water quality is good. While this is excellent after the council have removed the sand from the whole lagoon area it is a diminishing affect. The better the flow the more sand is brought in and the gradual deterioration until we are where we are now. At this time the levels of sand are such that even if the entrance is open it is temporary. It is a problem and water quality is a major concern for everyone for all accept the 12 months after clearing. So my suggestions would include. Need to have clean ocean water pumped into the lagoon west of the caravan park all year round. Slowing of the in tide and the flow of sand would be helpful to reduce the rapid silting of the lagoon There will still need to be some major works to remove sand at regular intervals. This is a major resource growing in popularity every year and the water quality is a health hazard for us and our grand children. Thank you
74	After reviewing / reading the information provided by council and being a local resident and user of the local water areas, I am in strong support of a stronger initial investment for best effect; and also potentially lower maintenance cost. I'm not sure if the cost indicators are based on initial cost or overall cost (initial + ongoing maintenance) But a more permanent solution would seem best with the Ebb Tide Channel (Without knowing the mobile sand pumping situation in terms of running and maintenance costs. If that was not prohibitive in maintenance then possibly that is also a genuine option to select) Beyond protecting the primary issue of flooding of local areas, the area is heavily used all year round - from the back of the lake to the front of the lake, and it would be beneficial to provide and ensure a clean and safe environment. Thanks for taking the time to provide the preliminary information and opportunity to provide feedback
75	The entrance to the lagoon is not natural. Man made the problem. (ICOLL and berm situation). Pumping seems the best long term solution and this has been discussed for decades!
76	I believe that the current method of opening the entrance prior to or during a heavy rainfall event using a large digger is most likely the most effective way to alleviate the flooding events. As long as the opening are done in a timely manner I expect that the flooding issues will best be managed this way. Long term options will still see the lake opening cover up with sand so it would still need to be carted away during extended dry periods.
77	As a resident near the lake I support Council's short, medium and long-term planning options. Council's short-term strategy must ensure that the safety of homes adjacent to the lake is protected during storm events and future flooding must be avoided. Council's plans must be nimble enough to ensure that this is the number one priority. To achieve this aim, the lagoon's entrance would need to be open more permanently. I support a permanent opening. Whilst a break-wall has been discounted, this would appear to be the only permanent long-term option. Surely the capital costs upfront now would be repaid by avoiding ongoing works?
78	At last the Council is considering a permanent solution to the silting up of the lagoon entrance. The Mobile Sand Pumping idea is by far the best option. The proposal indicates diggers to remove sand. Why would a subtle dredge not be a better idea? The diggers stir the surrounding water and are difficult to keep depth consistent, often exposing sharp shells that were buried deeper below the sand surface. Would this operate all year round or only in the of season? When the bridge was replaced many years ago the replacement bridge was shortened and allowed reclaiming area on the western side of Ocean St . By making the entrance channel meander further it slows the flow thus depositing sand. Could pipes be installed under the road on the north side of the entrance bridge t allow an improved direct route for the flow to the west side of the bridge? It would also be desirable for more sand to be removed from the west side. This has continued to shallow and the existing hollows near Pelican path that have been longstanding fishing sites are almost gone now! Any correspondence with local fisherman will support this observation. Hopefully a good decision is reached quickly and not bogged down with more obscure studies and red tape which is often the case. This area is too important to delay further. Thank you for the opportunity to comment..

79	Siltation of all our lagoons has reduced the head of water that maintain their flow. The pumping option has the benefit to remove sediment and in turn increase the volume of water. Additional, the pumping option is also portable so could be deployed to the address the water quality issues at Curl Curl and Dee Why Lagoons. I believe an overarching management plans for all our lagoons should be in place. In my opinion Curl Curl Lagoon has the greatest need of attention.
80	It would be helpful if the council could produce a video with the detailed options for short, Medium and long term stratergies. I personally feel the council has done a fantastic job (to date) with the lake managment however I feel the council need to improve on the communication platforms they share their messaging. I am also happy to discuss further Kind regards
81	I support the option to create flow pipes in combination with periodical mechanical opening of the lagoon to maintain a mechanism to keep the lagoon clean and useable as one of the rare water-access areas for families with children and dogs.
82	Mobile sand pump option looks interesting, but then I read a bit about it in Mandura WA https://www.mandurahmail.com.au/story/5888089/community-raise-concerns-over-sand-bypassing-in-mandurah/ and locals are complaining that it brings a lot of silt up and makes water really murky. Our sand looks cleaner, so it may not be such a problem, but would be interesting to know more. 1) how long will it take to pump necessary quantities of sand (40 000 cubic m?) to Collaroy 2) how likely this murky water issue is estimated to take place at Collaroy? Thanks
83	Hi, please keep the lakes entrance open by whatever means. Thank you.
84	I would like to see the lagoon go back to the 'old days' of management. Bring back dredging. When there was dredging full time the lagoon was much better. It was deep, people were able to do water sports. Bring in a private contractor like before, that way it would cost the Council nothing.
85	Please make sure the lagoon is opened regularly. Sometimes the creek that is parallel to Garden Street is so stagnant. My dog drinks it and gets sick.
86	Definitely not a permanent Breakwall or Low Flow pipe, please. I favour the sand-pumping option supported by Ebb Tide Flow management but need much, much more information on the sand-pumping element including noise abatement and control; maintenance regime; environmental effects; public safety;etc. etc. Whilst I feel for the contractors who will lose business, the current periodic short and (in particular) medium-term remedial measures cause far too much environmental damage to be justified or sustained. Those truck movements should be stopped as soon as possible I also need to know more about the modelling that has taken place on the Ebb Tide Flow management. Please keep me posted. Thanks
87	I support Councils current short and medium term management of the Narabeen lagoon entrance and I support the creation of an ebb flow channel and mobile sand pumping as longer term options. I do not support the low flow pipe option.

88	After reviewing the information provided, and being a local resident (emerald st) who uses the lagoon almost daily for either myself or my wife and 3 kids, I believe the option of pumping sand down to the southern end sounds like the most suitable option overall. I do believe this would also have a positive impact on the sea life, protection of houses on the mid-south beach strip, and could possibly improve the quality of consistent surf (think snapper and Kirra). All of these would be significant positives for narrabeen and the northern beaches. I hope my comments can be taken into consideration.
89	Thanks for providing such great detail and numerous options for consideration. I'm opposed to anything that looks unnatural such as breakwalls and similar man-made 'crude' options. The mobile pumped sand option appears to be the best in terms of the key considerations.
90	why dont we dredge the back part of the lake therefore making it wider for better use for boaties and kayaks alike and also the lake would hold more water i.e more water coming in and out less chance of blocking up the front
91	I know and understand the current entrance management strategy, based as it is on sound engineering, which I support. That said I have observed in the period since the last clearance a welcome finer tooth approach to utilising interim breakouts and better temporal alignment of lagoon water level and optimal tides on an opportunistic response to these conditions as they present. This has resulted in an interim benefit in terms of overall cyclical water quality as well as improved recreational benefit in between each 3-5 year major reduction of the broad crested weir of marine sand infill, West and East of the road bridge (the stone wall abutments of which appear to be in need of maintenance). One thing I would advocate is more accurate measuring of removed quantities by means of a temporary weighbridge for each truckload. I say this because the present method of quantity assessment relying as it does on x amount of loader buckets per truck load seems to me to overstate the quantity actually loaded out on the 6,000 truck trips, due to the fact that the sand is worked up by machinery possibly three times before it makes it onto the truck. It would be most interesting to see how the data based on cubic measure stacks up by cross checking some loaded trucks on the Kimbriki Tip weighbridge to determine whether this is a significant discrepancy. Such a check would also benefit in terms of having a better measure of the true amount of sand transferred to Collaroy,
92	After being evacuated in February 2020 flood we are pleased that council has been maintaining/monitoring the entrance opening and closing
93	Stop putting sand from building cites on the beach, wouldn't say it was a regular occurrence, I saw 80 x 10 tone loads of pristine sand, emptied at South Narrabeen, due to Southerly conditions the sand eventually ends up at North Narrabeen lake entrance, and when they clear the entrance, it gets reintroduced at South Narrabeen, have you ever seen a dog chase it's tail?!?! No one beats the ocean
94	I have lived in North Narrabeen intermittently for 31 years. I also own a home within the flood zone (medium risk). Both sets of my grandparents moved North Narrabeen in the 1950s and my parents (have never left!) still live in North Narrabeen. My favourite memories growing up include swimming across the Narrabeen Lagoon entrance. I hope the Lagoon entrance can be maintained and enjoyed by my own children and generations to come. I would like to see the least environmental and aesthetic impact on the lagoon (i.e. as close to nature as possible). Based on the report provided, I believe the mobile sand pumping option shows the most promise, however further investigations by Council is required before a preferred option can be selected.

	Please see below comments on the Narrabeen Lagoon Entrance Management Strategy. • Why has the 'do nothing' option not been reported? This would give the community an understanding of why the lagoon entrance requires management and the impact of not intervening. • How is Council managing the development of the catchment and the quantity and quality of stormwater? This directly impacts the quality of the water in the lagoon and potential for flooding. • Consideration should be given to the long term option of mechanically opening the lagoon when required (ie no dredging) as proposed by Professor Andrew Short in the Pittwater Life magazine, March 2021, page 8. • What has been the impact of the construction of the Narrabeen (Ocean St) Bridge and foreshore realignment on the behaviour of the lagoon? Would the replacement and realignment of the bridge alleviate sediment build up at the entrance? • The option of a breakwall should be included in the report to satisfy the community that it has been considered as an option and to compare it against the other options presented. • General: the traffic light analysis requires a key to clarify how the options have been scored. In particular, for subjective criteria (environment, aesthetics etc.). Council should also provided the indicative cost of each option and whether there will be any impact on residents rates. • Mobile Sand Pumping o The diagram shows the pipe continuing to Collaroy Beach car park, however there is no discharge point shown at this location. Is this an error? o Council should provide further information; diagrams, photos etc. of the permanent infrastructure (pumping stations, discharge points etc) to enable to community to assess the aesthetic impact of this option. o Preference should be to bury the pipeline. o Is there a cost savings by selecting this option (i.e. reduction in truck transportation of sand to Collaroy)? Otherwise what is the benefit of this option? • Ebb-Tide Channel o this option requires a diagram to show the dimensions of the wall relative to the lagoon (including tide levels). o It is unclear how this option has been rated low environmental impact, considering the impact to fish schools and sea grass in the localised area. • Low Flow Pipes o this option should not be considered on its own, as the report states that additional measures would be required. o The report has a photograph of an open concrete channel, however the option description is for pipes? If it is an open channel, this option would have a high recreational impact, as it would prevent swimmers from crossing the lagoon entrance. o Not withstanding, this option should be dismissed due to the high cost and environmental impact.
95	To Whom it may concern My memories of how the lagoon or as we knew it " lake" are a distant remnant to the way the Lagoon has silted up today. A scan through Near Maps from 2009 to today show that the sand east and west of the bridge has never really been removed, the depths marginally changed by the excavation process undertaken every 4-5 years as Council has stated. I have a deep love of the lake/lagoon from my childhood and to this day I fish the area both inside and on the beach. I have a keen interest in the environmental condition as this provides great fishing. All the other water based activities that occur in the catchment benefit from a healthy system, this is under pressure with all the development in the catchment areas from Belrose to Ingleside and Warriewood.

	This man-made interference requires better management by Council and artificial intervention is imperative now that the catchment is no longer in a Natural State. Every year the Lagoon is putrid and Water quality low during the summer months, I cannot remember when there were really good water flows in the last 10 years. The cycles of closure are frequent and opening only occurring around high rainfall, even prior to 2016. I am no expert in marine engineering however I do take note of when the entrance is opened and within three weeks its closed, the current practice is not effective. In my opinion the opening is excavated too far south of the existing rock shelf and a deep scour as stated doesn't really occur. At the time of opening if you tried creating the trench in a line that runs straight from the sea wall to just south of the pool the wave action may not close the opening so quickly and more sand will be displaced over the rocks. The cycles of closure are frequent and opening only occurring around high rainfall, even prior to 2016. I am no expert in marine engineering however I do take note of when the entrance is opened and within three weeks its closed, the current practice is not effective. In my opinion the opening is excavated too far south of the existing rock shelf and a deep scour as stated doesn't really occur. At the time of opening if you tried creating the trench in a line that runs straight from the sea wall to just south of the pool the wave action may not close the opening so quickly and more sand will be displaced over the rocks.  **Short Term - Medium Term Management** Removal of the sand build up East and West of the bridge to allow greater water holding capacity during rainfall events, this would in turn potentially create a greater flow when opening is required. The sand build up at the moment is high and requires at least double the normal amount removed otherwise the same results will be repeated. **Long Term Management** The sand pumping option appears to be the best offered however there is no strategy for removal of sand West of the bridge. The other options on face value appear to be hit and miss and provide minimal effectiveness. Thank you for the opportunity to provide an opinion, this is a difficult problem to find a solution to . I hope that Council will adopt an effective strategy that won't be a temporary resolution, one that will be cost effective over the long term. T he enjoyment financial and benefits to the community will be worth the expenditure.
96	**<u>Narrabeen Lagoon Entrance Management Strategy Submission</u>** This submission by Cromer Golf Club is to provide feedback to Northern Beaches Council on the Narrabeen Lagoon Entrance Management Strategy project and the management options outlined. 1. Cromer Golf Club (CGC) is located at the south-western edge of the Narrabeen Lagoon (the Lagoon), bordering the lagoon between Middle Creek and South Creek. The boundary of the golf course broadly runs along the western edge of South Creek from the lagoon almost to Toronto Avenue in Cromer. 2. CGC has a water licence which permits the annual extraction of approximately 70ML of water from South Creek.

3. This water is extracted at the weir across South Creek. The weir is located near the entrance to the walking track on South Creek Road. This entrance to the walking track is close to the point where South Creek Road turns in to Rose Avenue.
4. The area of the golf course adjacent to the Lagoon and for most of the length of South Creek is relatively low-lying. In periods when the Lagoon entrance is closed these areas of the golf course are frequently subjected to flooding, water damage, debris from creek overflow and a decline in water quality from Lagoon water 'leaking' upstream into creek water. These issues are exacerbated during heavy rain events.
5. Even without heavy rain events, when the Lagoon level approaches the "one metre higher than mean sea level" threshold the Lagoon water backs up into South Creek and its tributary streams and can create localised water accumulation.
6. The costs of flooding, other water damage and the deterioration of creek water quality are significant and include:
    a. Closure of the golf course (loss of income from green fees, cart hire, food & beverage sales). Based on our 2020 operations, for each day the course is closed our earning reduce by almost $4,000. This is the equivalent of the annual subscription fees of one member, which then needs to be replaced.
    b. Repair of damage to the course (including labour, debris removal, loss of course materials and equipment, replacement of sand, soil, and turf). As an example, the repairs following flooding after the rain event in February 2020 resulted in an insurance claim under our existing policies of over $200k.
    c. Outside of the claim noted in item b), smaller flooding results in labour cost to rectify damaged playing surfaces.
    d. Loss of amenity (including inability to service our members, deterioration of playing surfaces, impact of poor Lagoon water quality e.g. odour, impact on course flora and fauna).
    e. Loss of productivity (the inability of course staff to undertake scheduled work and their diversion to course repair activities, which has a consequential affect on amenity to our members).
    f. Insurance costs (higher premiums and deductibles, assuming suitable insurance policies can be secured).
7. CGC is seeking a Lagoon entrance management strategy for Narrabeen Lagoon, which reduces the number of :
    a. major flooding events on the golf course.

	b. days in which the lagoon level remains below the level of “one metre higher than mean sea level” but sufficiently high to cause Lagoon water to back up into South Creek and its tributary streams. This causes: i. low level local flooding, which reduces playability and access of golf carts to the course. ii. contamination of CGC’s primary water source, often requiring the use of low quality bore water, and consequent deterioration of our primary turf surfaces. 8. CGC would support Council **short-term** entrance management options, including: a. Reducing the “one metre higher than mean sea level” threshold to a level below 1 metre to ensure an acceptable Lagoon height is maintained and which avoid regular localised water accumulation and contamination of creek water. b. More regular mechanical breakout operations. c. A structured communication with stakeholders (including CGC) on the level of the Lagoon and timing of mechanical breakout operations. 9. CGC would support Council **medium-term** entrance management options, including: a. Removal of sand and marine sediment from the Lagoon entrance. While this does not immediately affect Lagoon flows at CGC it will improve consequential water levels at the western edge of the Lagoon. b. Desilting the Lagoon, particularly at the Western end of the Lagoon. c. Raising the height of the South Creek weir to make it ‘flood-proof’ and restrict Lagoon water from ‘leaking’ upstream with consequential effects on South Creek water quality. 10. CGC would support Council any of the **long-term** entrance management options which places a priority on reducing the amount of time the Lagoon is closed and enables entrance clearance operations to be more easily undertaken. While acknowledging a lack of detailed technical knowledge the: a. ‘Ebb-tide channel’ option seems to achieve this objective. b. ‘Mobile sand pumping’ seems a viable alternative. c. The installation of low flow pipes has the disadvantage of high cost and a lower impact on the duration of open entrance conditions.
97	NL 4008 Called the “Anti-Flood Sand Fuse” Revised 9-10-2018 A low cost, Water Level Adjuster and Flood Water Evacuation Device Designed by, [redacted] in Sept. 2006 as a modification of a mechanical valve Gate System I had also designed in 1990's known as The Pearly Gates, Anti-Flood and Water level Controlling Device. Located, slightly under, adjacent and parallel to the west of the Ocean Street Bridge. It is constructed wholly of the local lagoon sand of the north-western corner area of the bridge. This is sand that has been washed into the lagoon from the sea beach. The structure is a sand ridge about 12 metres wide at its base with a flat and level top. It’s highest span section, (Span 1) is adjacent the most northern of the six bridge spans. It's lowest span section is towards the southern end of the bridge. Spans 1 & 2 will rarely need to be

reconstructed. Spans 3 & 4 will at times become “PROGRESSIVELY SPENT” when they become eroded during a Potential Flood Event. They get washed out to sea when rising flood-waters spill over their tops. This rapid progressive erosion, allows for the rapid evacuation of the Head of Water backing up from the Bridge. There may or may not be pre-emptive mechanical erosion required, if given forward knowledge of a large downpour? It can be done as a precaution. (This is a stylised Side Elevation View detailing the SAND FUSE installation within the SIX available BRIDGE SPANS as viewed from the Western side) of The Ocean Street Bridge Narrabeen North End South End North Abutment of Bridge Span 1 1.6m AHD …..... Sand Fuse Span 2 1.5m AHD ..... Sand Fuse Span 3 1.4m AHD …..... Sand Fuse Span 4 1.3m AHD …..... Sand Fuse Span 5 0.0m AHD water No Fuse Span 6 0.0m AHD water No Fuse South Abutment of Bridge Sand ridge graded height levels vary for each of the SIX bridge spans. Further consideration to the design height of the Sand Anti-Flood Fuse. The heights of the sand ridges across the four northern spans to decrease in height of each one progressively by 10cm towards the southern end..... The Bridge has SIX spans. Northern-most (Span 1) 1.6m AHD. Sand level (Span 2) 1.5m AHD. Sand level (Span 3) 1.4m AHD. Sand level * (Span 4) 1.3m AHD. * Sand level (Span 5) 0.0m AHD. Requires only seabed levelling with 20kg size rocks Southern-most (Span 6) 0.0m AHD. Requires only seabed levelling with 20kg size rocks *1.3m AHD is selected, because it is the arbitrary height deemed by Warringah Council (in about 2000) to mechanically open the Lagoon's entrance to prevent flooding. Before that, 1.4m AHD was the chosen level. (to lower Rapid Flood event risk.) It is assumed that there will be no need for any sand fuses to be installed in the two southern-most bridge spans. Only some seabed levelling work (rock fill). At least one span is to remain open to allow fish movements. The determination of the (Span 5) will be made after the results of observations of the systems performance with it left open. Also the ultimate determination of individual sand fuse heights during the initial “Break in” period of the system. Spent Fuses will need to be reconstructed as soon as possible after flood waters have subsided. A west-ward 40kg bag-size Sandbag wall extension to the wall partition between span 4 & 5 may be required to prevent an Eddy forming, with an aggressive scouring action, attacking the fuses. [redacted]

Anti-Flood Sand Fuse (AFSF), Benefits. Revised 28-1-2015 AFSF complements the Training Wall at Narrabeen Lagoon Entrance. It fulfils the duties of the omitted and missing essential component of the Training Wall, that is: A Water Level Control Device. It partially repairs the unforgivable Environmental Vandalism done to the Natural, Shale Rock Weir at the Lagoon Entrance when in the 1980's. Some rock was excavated at the Entrance Area, that was essential to maintain Optimum Water Levels to a perched by 600mm lagoon. Levels essential for the marine life. That life had evolved to live in within the unchanged lagoon, since the last Ice Age. It offers an alternative and better solution to that of replacing the excavated rock. That rock removal actually assists flood water evacuation. Now it's absence benefits, the Anti -Flood Sand Fuse's effectiveness. It can provide adequate water levels to provide water cover to Zostera Sea Grass Beds, that can only survive within a narrow zone of water depth. As the lagoon's seabed topography of the seagrass beds is in the shape of Plateaus, the water level parameters are very narrow. The Optimum Level at High Tide is 0.6 m AHD. This is the historic water level evolved and set for the lagoon to remain a healthy Coastal Lagoon environment for it's inhabitants. It is also the desired water level for humans that Fish, Sail, Row, swim, and live with Narrabeen Lagoon. It is only when the Lagoon drains excessively, due to drought or the absence of an Entrance Intruded Beach Sand Plug. That the amenity of the lagoon suffers and complaints of shallow water are heard. Nobody is complaining of shallow water in January 2015 because there is a massive sand plug retaining the lagoon's water. Unfortunately in this condition Flood Risk is extremely high and the migrated sand must be removed, for only that reason and to return it to the Collaroy / Narrabeen Beach. The Anti-Flood Sand Fuse prevents flooding & property damage.. It progressively erodes

whenever water levels rapidly rise above predetermined levels. This rapidly evacuates head waters that have built up upstream from the Ocean Street Bridge. The existing and now free-flowing Training Wall then directs the flood water efficiently to sea. Road closures due to flooding prevented. Note, Wakehurst Parkway Flooding is mostly caused by vegetation choked feeder streams to Middle Creek, regardless of the Lagoon Water Levels. The Anti-Flood Sand Fuse prevents the Ingress of Intruding Beach Sand. Because the Sand Fuses constrict the tidal inflow, the inflow water velocity east of the Ocean St Bridge is controlled and lowered to where beach sand is not swept up and transported west-ward up to and beyond the bridge. This also reduces the frequency of expensive Mechanical Sand Clearance Operations. Operations then, only required on the east side of the bridge, adjacent to the Entrance & beach. If the beach sand intrusion into the lagoon is reduced, then the migrating sand remains within the headland boundaries of the Collaroy / Narrabeen beaches. Sand Nourishment demand to the beach will reduce. Beach properties can sit at a lower risk level of being eroded. This issue also needs to be addressed. I will describe why before I return to the Anti Flood Sand Fuse topic. Sand Stabilisation Experimental Programs undertaken over the last 40 years have completed their Operational Life Cycle and need to be redone. (Dunes Bulldozed, to a low and flat profile and be replanted with suitable plants. The next 40 year cycle.) They are no longer protecting Beach Front properties, but are placing them at a heightened risk of being impacted by wave action. Over the 40 years, Sand Dune Vegetation has been, progressively trapping and holding wind blown sand. Plants overgrow sand buried plants repeatedly and this action sculpts the Sand Beach to become steeper than normal. The beach has become much narrower, with most of the available sand stacked up very high at the back of the beach. When a storm event happens, wave action against a steep beach undermines and erodes faster than a flatter, sloping broad beach buffer. Back to the AFSF topic. As the AFSF will protect the Marine Habitat and marine nursery areas, marine life will flourish. The lagoon will regain it's reputation, as a Top Fishing & Prawning Spot. When a marine area is in pristine condition, it's tourism value increases dramatically. Businesses, boat hire, water sports, tackle shops, Real Estate rentals, general retailers in the area and the Narrabeen Caravan Park will all benefit. [redacted] How best to make it happen? 28-1-2015 The AFSF is relatively cheap to construct, when costed as a parcel of “Extra Work” when the Sand Clearance Operation Contract is under way. Indeed, it may benefit the excavators by restricting unwanted water flow to the areas of their work. I'm sure the Excavators will wish to first construct the AFSF and their Sand Coffer Dam, prior to Entrance Sand removal. It is thought that Modelling Trials of the AFSF device (in miniature and/or computer) is a costly waste, as there is nothing to be lost by actually making the device on site.

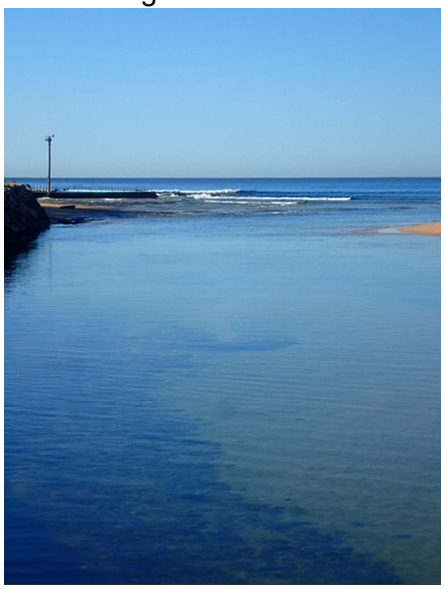
…….....
..... Requirements: DPI NSW Fisheries, Permission to modify a navigation Channel. Council: DA A sufficient volume of Local Intruded Beach Sand, stockpiled beside the North-West corner of the Ocean Street Bridge, next to the Caravan Park and the Pelican Walking Pathway. Amounting to enough volume of sand to construct the 14 metre wide x slightly less than 2.0m high sand ridge wall. The length being slightly under 60 metres. Plus have an equal amount of additional Stockpiled sand, handy at that location for initial and ongoing adjustments and replacement of any “Spent” eroded Sand Fuses. The Four Stepped Design, of the device enables easy “ Drive over DRY”access to Spent Fuse locations via the North-Western shoreline area. Site Supervisor. Plus 2 x Assistants Surveyors x 2 (required to assist in accurately sculpting the Fuse Heights) It is suggested that 5 Water-level Marker Ruler Strips be attached or painted on the west sides of Bridge Span dividing walls. To be used when “Fine tuning the Optimum Operating Heights of the Sand Fuses and when reconstructing spent fuses. Bulldozer operator. Assistants to perform fitting barricades, sand fitting in span 4 end, site security etc Excavator (low height and/or long reaching tool) suitable to fit and work under the spans of the bridge. In

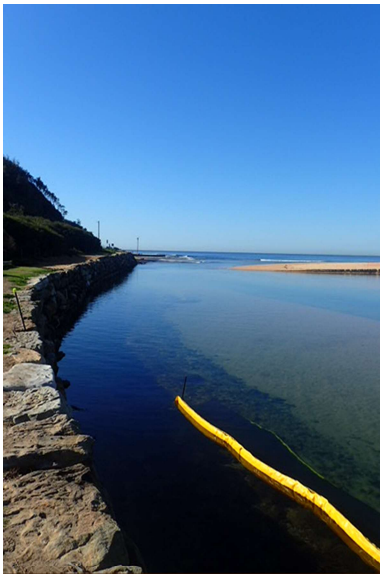
	the event of a failure of the Sand Fuse Device to perform in preventing flood water escaping. It (the sand ridges) could be dismantled within a couple of hours at minimal cost, or simply left to self erode. If it works. Everybody wins..... If it fails in some way.....it didn't cost much.....it will not have damaged anything. It's design can be useful in designing mechanical Lagoon Entrance Water Flow controlling devices, and/or replacement of the natural rock weir. Please note, Earlier documents state 1.4M AHD as the arbitrary water level to mechanically Break Open the entrance that was revised to be 1.3m AHD. In about year 2000 by (NLJE & FM C'tee) of combined P.W.C. & W. Councils. [redacted] 9-10-2018 …..... ..... Edit 5-11-2018 If the (AFSF) is constructed following the November 2018 works. It be noted that if around 500 x 20Kg sandbags be placed in the voids between the Bridge wall between span 4 and span 5. With some of the bags extending that bridge wall to the west, to arrest eddy currents erosion of the sand fuse. The specifications of the 20Kg capacity, sandbags: made of UV Stabilised Woven and coated Poly Fabric. Of equal Specifications of Rheem Canvacon 14SS 14 x 14 weaves per inch of HDPE and coated on both sides with LDPE. Rot proof sewing thread and/ or welded seams. End closures being Stainless Steel Tie Wire Twists, fitted securely. Edit 6-11-2018 Following Site Meeting with NBC's Todd Dickinson & Duncan Howley. Prior to the wind up of the Major Sand Works in Mid December 2018. The construction of the (AFSF) device is desired to prevent repeats of rapid sand reentry per previous Earthworks. Roughly two volumes of Sand Fuse, Construction and maintenance Sand are required to remain at the North west area location of the Ocean St Bridge. Required sand. Sand Fuse Length = 60m Width of base 14m maximum height for the calculation (say 2.0m high). This equates to 1,680 cubic metres of sand. Plus, sand to fill 500 x 20Kg Sand Bags being 10,000 Kg (…....cubic metres) Total sand requirement (..=.....cubic metres) [redacted] 6-11-2018
98	Dear Northern beaches Council Floodplain Planning & Response Team We have met members and been in email correspondence with your team since our house was flooded during a 2016 ECL weather event and then nearly again a few years ago. We live on the lagoon and swim, surf, fish on or near it daily. We like to think we are keen observers and in fine tune with the different stages of water quality as well as conscious of the state of the local Fauna and sea life in accordance to water quality. Despite being an 'ICOLL, with the modern pressures of urban runoff having the lagoon with a mostly open entrance now seems to be the generally agreed community consensus. Two major flooding events in last 8 years would have been prevented with an open entrance and a better council strategy at the time. With global warming incorporating sea-level rise and increased extreme weather events now a reality & scientifically accepted, it is time to find the best lagoon solution factoring in a worst-case scenario. Objectives? *Mitigate flooding and closure of Wakehurst parkway that restricts emergency services access to NB Hospital. *Mitigate flooding to surrounding residential and commercial areas within the lagoon flood plains. *Maintain and improve lagoon water quality to benefit of fauna, sea life as well as human recreational use. **-Path of least resistance (could also be the Path of lowest council expenditure)** We have had regular and cordial email correspondence with Valerie Tulk since a major flooding event that affected us directly but us and many in the community remain frustrated by council continuing to open lagoon entrance south of what is the now naturally occurring channel.

When we mean “now naturally occurring channel” Is the natural flow since the stone seawall was installed on the northern side of the entrance from ocean St bridge North and East terminating near the swimming club amenities building. As far as we have been able to determine the current bridge and sandstone wall was installed 1954. This Sandstone wall is key in the puzzle to keeping the entrance channel deeper and maintaining as open longer. And in all correspondence, we have had and everything we have read this wall has never been considered a factor in determining entrance position, direction, shape or depth. Maximizing flow velocity and scour effect is vital to the entrance self-managing. The wall will always direct flow along the N side scouring down to the sandstone and cutting out sand from the North across to the more southerly side. When the lagoon last naturally broke it was in this position and the entrance maintained as open for an extended period.

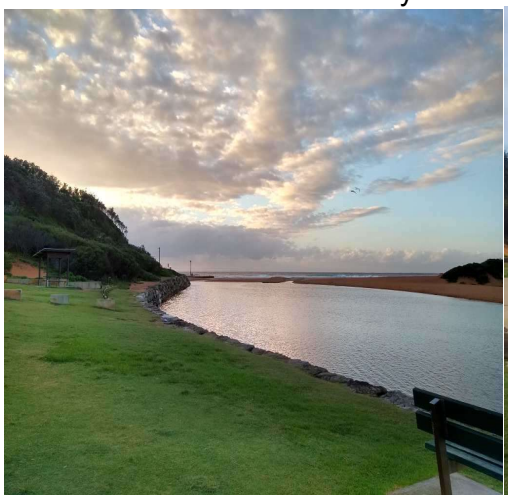
Continually opening the lagoon south at the closest point between lagoon and ocean shoreline creates a shallow meandering low velocity mostly sand entrance. This hinders the lagoon getting a good flush and usually closes over within 4- 6 weeks.

Please for just once can council try the path of least resistance and help remove sand on the N where it’s evident the water wishes to travel. Many of us think you may be surprised at how effective nature will do the job. If you wish to keep digging the channel too far south, then you need to look at reshaping the stone wall to direct the current where you wish it to go.





Entrance flow as directed by N wall.



Natural N flow Vs S manual opening

Shallow S low velocity entrance

Manually opening Southern side of entrance

[redacted]

Regards the other proposals being considered to maintain entrance the only other viable and realistic option we support will be dry sand mining pumping sand back to replenish South Narrabeen Beach, especially once Collaroy seawall is finalised ,as modelling shows wall will accelerate longshore drift.
We would appreciate your feed back to our suggestions.

Part B: emailed submissions

Number	Submission
1	Good afternoon, My husband and I were away when we received the information about the Narrabeen Lagoon strategy. Our opinion is as follows. The whole lake needs to be dredged as it is too shallow which is a major problem for flooding. Council said years ago that they were going to dredge the lake and have not done it. We have made several phone calls over the years but that goes no where. This email is also probably a waste of time but it is all we can do to keep urging council to clean up the lake property. Narrabeen lakes is the highlight of the area and it is such a shame to see it in such poor state. People will be able to walk across it soon and won't need a kayak or paddle board. Please consider doing more than just the entrance that millions of dollars is spent on with no long term effect. I hope somebody that really cares reads this email. Thanking you
2	Re Narrabeen Lagoon Entrance Management strategy As a resident directly impacted by the lagoon issues, it seems that there is no way to predict in advance when any rain may impact a closed entrance through sand build up then our suggestion is to take steps to keep it open on a permanent basis. I have seen 3rd would countries that have had a more organized dredging system than we have had here is one of Australians most advanced cities. • Implement a proper dredging system with a replanned purpose • Put a rockwall on the northern side to assist in permanent opening • The maintenance is not being done correctly as it stands now • Without the lake being open at all times it creates public liability for an unclean waterway • The sand level keeps rising in the lake due to no real plan to maintain it

	• On a yearly basis there should be sonar measuring to take place that verifies the min max depths • Take the sand out via dredging and sell the sand This is a public area with hundreds of houses impacted by a lack of planning and or a lack of ongoing maintenance.
3	Please find the ATTACHED Document, **Anti-Flood Sand Fuse Device, 4008** , outlining an entrance Management concept that utilizes the Local beach sand to control Lagoon Water levels and Entrance Area water velocity. I look forward to answering any questions that you may ask me about the Anti-Flood Sand Fuse Device. Plus the related Collaroy / Narrabeen Beach Sand issue. Thank You, *(submission appears above in the online submissions table)*
4	Hello I live in Narrabeen and have done for the last 7 years. Since living hear we have been frequent users of the path around the lake, Jamieson park and also the lagoon entrance at North Narrabeen. We have missed entire summers of being able swim in the lagoon with our young children as the entrance was closed and with no rain forecast, council never opened the lagoon which meant the water was polluted with signs up saying don't swim. We have known about the current reactive strategy for some time where by the lagoon is only opened when there is risk of flooding. Unfortunately this wasn't done to my recollection during the storms of 2016 which led to wide spread flooding. Additionally we know the council has been 'lookokg into' an overall management strategy for some time. There a numerous benefits of having the lagoon open and flowing all year round, better fishing, recreation, water flow - the southern end of the lake feels like stagnant water! I feel that it is time for council to be open and transparent with what the proposed options are and a committed timeline to make a decision the a committed plan to implement. Ultimately what I am saying is stop kicking the can down the road and make a decision!
5	What about putting a pipe from the ocean to the lagoon under the sand so the water flows back and forth deep under the sand then it won't matter if the sand builds up. Make the pipe low enough so it would be unusual for it to be exposed. That way the water will flow in and out of the lake via the submerged pipe. Regards to Narrabeen lagoon opening and closing strategy to north Narrabeen beach. How about putting a pipe deep under the (mouth)entrance so that the water can flow back and forth from the lake to the ocean and back. It would be a big pipe and deep enough to work. The pipe would be deep enough for it to be an unusual event for it to be exposed. Therefore the sand can do what ever nature intends and it won't effect the flow of water out of the lagoon and into the lagoon from the ocean.

6	It appears that around every 2 years the Council undertakes some form of Floodplain Risk Management Review, study or review for the management of the Narrabeen Lake entrance. The last report was the Cardno report in 2018/2019 which followed up Cardno's 2016 report. In 2013 there was another study prepared by BMT WBM with many more studies over the previous 20 years Within the last review, Cardno reported on some 20 potential structural options for flood reduction and lake entrance clearance. Each one of these past reports have indicated that if the lake entrance is open then the flood risk is almost zero. That is why **EARLY** mechanical breakout has proved successful. Neither the latest Cardno report nor any of the previous reports have investigated the positioning of the entrance. **No report has considered moving the current entrance to be in a straight line of the Ocean St Bridge as it was prior to Council moving it to its current position it in the early 1970's. (50 YEARS AGO) In particular removing the "S" shape bend from the western side of Ocean St Bridge to the lake entrance.** **Additionally, no previous report has analysed the effect of the "S" bend on the outgoing water flow in its own right and whether the elimination of the "S" shape bend would assist in Berm removal and improved scouring at the entrance.** **The "S" bend acts as a restrictor to the outgoing water flow and this is ONE major factor in the entrance closing.** Additionally, each of the previous reports including council's current information video state that a certain level of water is required to force the Berm build up to be pushed back out to sea, **however no analysis has considered pumping additional seawater into the lake to give it the necessary force to do this on the outgoing tide. The low flow pipe solution is not the answer.** **SO WHY HAVE THE FINER POINTS OF ADDING WATER TO THE LAKE AND THE RELOCATION OF THE ENTRANCE NOT BEEN A POINT OF ANALYSIS BY COUNCIL AND THESE PAST REPORTS?** **A REVIEW MUST BE CARRIED OUT IMMEDIATELY INTO THESE 2 OPTIONS INDEPENDENT OF EACH OTHER AND COMBINED TOGETHER PRIOR TO ANY DECISION BEING MADE.** Implementation of the above actions would mean that the little alcove beach at the east side of the Ocean St bridge would be sacrificed however this is a small price to pay for a solution that provides better outcomes for the entrance remaining open. The loss of this beach area would be more than compensated with the forming of a much larger beach along the north retaining wall on the opposite side of the channel. **Summary** The solution to the issue is basic. What is needed is an unrestricted flow of outgoing water that is equal to or greater than the flow of incoming water (on a daily or periodic basis) thus ensuring there is no Berm buildup.
7	Re Narrabeen Lake flooding. I have lived in Parukala Place for 60years and have observed the actions of Narrabeen lakes over that period. Darius Ave / Parukala Place have never flooded in that 60 years when the lake entrance has been open. The only time we flood is when the council is tardy in opening the lake, sometimes 12 to 24 hours after the water has started rising in the above streets. The frequency of flooding has not increased, but of late the severity has. At 1 to 1.3 on the gauge in the lake, the level the council opens the lake, the water has already started to rise in Darius Ave. Allowing for the delay in the council opening the lake we are well and truly flooded by the time the lake is opened. My observations over the past 60 years has convinced that if the lake is open the tide seems to have very little effect on the lake flooding. On my most recent trip North I noticed that the mouth to the two most norther rivers have big gantries across them with large pipes extending down into the river bed and an exhaust pipe going to adjacent northern beach. While this might not be the most picturesque solution it must work keeping the

	mouths open. We in the above streets will be extremely grateful for any method that you come up with to keep the entrance open.
8	I'm a resident of Narrabeen for the last 40 years and live at [redacted] Mactier St. We paddle board in the Lagoon daily and know it well. I have read all the information that you have provided and thank you for the overview. I have watch the lagoon over the years and seen the impact on Lagoon / sand / vegetation with floods and the current management. The stone wall built at the entrance many years ago made a big improvement in the flow of sand at the entrance making it easier to open. I do not agree with the policy that the lagoon needs to be a particular height before the entrance can be opened. Having the entrance open 99% of the time improves the water quality, prevents local flooding even if this is just the pathways around the lake which are now in constant use. I would like to see the entrance cleared using small diggers on a monthly basis. That way if there is a heavy rain fall it is not a major problem to open the Lagoon. At present sand is taken back to Collaroy just to be washed back down to Narrabeen. But sand is also washing out of the Lagoon and you can see the damage to the shore line with all the fallen trees ending up in the lagoon. Why can sand not be placed also on the lake shore line to protect the tree line? Particularly in well used public areas. To stop sand being washed down from Collaroy, rock wall structures could be placed in a couple of places out into the sea to slow down the massive sweep of current that runs during big surf conditions. I have attached some google maps photos of LA beaches in the USA where this technique is used to great effect. Although the initial cost maybe greater the long term benefit would save a lot of money and help the homes and the sea wall that currently being erected in Collaroy. We use to dredge the lagoon this has now stopped – it was looked at a few years ago but it was said the cost was too high. The report at that time showed that a major cost was paid to the marine department for removal of sea weed psm. The sand could also be sold. This is crazy that a government dept should be charging a cost for service to the public when it is not for commercial gain. This should be looked at. The Lagoon depth is also reducing due the erosion of the shore line. This effect must make it harder for a volume of water to help flush the entrance of the Lagoon. I trust these thought are of help to you in planning the future management of the Lagoon.
9	A few points on the Narrabeen lagoon entrance management strategy Options: Short Term - the mechanical opening periodically works fine for me. There seems to be unnecessary carry on by the community regarding water on footpaths etc, but as a resident it does no actual harm and is reality of living in a flood plain. Equally amenity of the lake for swimming etc is not a reason to open the lake. We have more beach pools and patrolled

	beaches and council run swim centres than anywhere in the world. Its madness to open the lake just for swimming amenity. With so many other options nearby Long term: 1. Ebb tide channel looks promising as it is more passive once constructed. It might change surf conditions, but its subjective whether it will improve or worsen the abnks, in any given swell condition. I think it has a lower aesthetic and recreation impact than indicated by RHK, and could add low tide fishing or swimming options. Nippers will be jumping off them, racing around them etc depending on material and sand profile. 2. Mobile sand pumping is my 2nd favorite. However is not as 'passive' as an ideal permanent solution 3. Low flow pipes – waste of money. Literally dozens of swimming options within metres of the lake. Not a good use of money for the release of a few sea lice. Entrance Clearance: Would support less intrusive approaches, including running dump trucks along the beach (to reduce road traffic on the Coll-Narra stretch) , and or running at night on the beach when there are much less users. This might be a cheaper, and possible to do more frequently, but shorter duration. Ie before the sand gets under the bridge. Keep up the good work council!
10	I refer to Council's recent publication re current and possible future options for the Management of Narrabeen Lagoon Entrance and request for comments and suggestions in this regard. The Study advises that the main problem with opening the closed entrance is caused by the lack of rainwater to raise the surface level of the lagoon to above that of the adjacent sea level. All of Council's past opening operations have relied on the heavens to open up to deliver the necessary volumes of rainwater to achieve Council's aims. As your publication advises it once took four years for nature to complete this task. There is however an alternate abundant supply of water immediately available nearby - the Pacific Ocean. One of the suggestions contained in your publication is for the provision of a Low Flow pipeline to provide gravity-fed sea water to assist with the reduction of stagnation of the lagoon waters at times when the entrance is closed. The nearby rockpool is re-filled after regular cleaning by the use of a pump located generally at the seaward end of the suggested Low Flow pipeline. Is it possible that this pump, or additional/alternate pumps, could be connected to the intended Low Flow pipeline to provide a continuous inflow of seawater to the lagoon when required to raise the surface level to that needed (RL 1.3) for a "breakout" ? Obviously a large pump/pipeline system would be required to sufficiently raise the lagoon's water level. Council's hydraulics specialists would I'm sure be able to calculate and provide the necessary sizing details and resultant timing. A suitable pump system could however provide Council with some temporal certainty toward achieving the end result and therefore Council, rather than nature, would be in control of the Lagoon entrance. It may well prove however that the pumping system and/or time required to sufficiently raise the level of the whole lagoon is far too great to be considered a rational undertaking. There is however a possible truncated option to this concept. Photo '18 Oct 2018' in your document shows that a temporary sand barrier has been constructed just upstream of the entrance to assist with sand removal operations. If a similar sand barrier was also provided adjacent to the Ocean Street bridge at the time of carrying out the pumping operations it would isolate that area and vastly reduce the required water volume, and hence time, necessary to raise the surface level to that required for normal mechanical opening procedures.

	Would that volume however provide enough impetus to widen an initially mechanically cut pilot channel and sufficiently open the entrance? Could the water level in this isolated section be raised above R.L.1.3 (but below the adjacent roadway) to assist by providing additional required volume? Once again this is an exercise for Council's specialists or possibly the Manly Hydraulics Laboratory. Should it be determined that this will provide an insufficient volume of water for the purpose, consideration could be given to constructing the sand barrier somewhere further upstream (extended along the banks to prevent property and Caravan Park flooding) to a location where calculations show that the desired result can be achieved. Following successful entrance opening the upstream barrier would be removed to allow for tidal flows to the whole lagoon. Weather patterns and predictions would of course need to be monitored during such an exercise to avert possible flooding from overfilling. I feel that Council's consideration of the provision of sand pumping via a buried pipeline along the beach to Collaroy is a much preferred option to the trucking of removed sands. Excavation/dredging similar to that currently adopted would however still be required to deliver sands to the pump's location. Whilst a pipeline and pumping will be an initially more expensive exercise it should provide Council with a permanent, efficient, suitable and locally preferable method of sand transferal and result in long-term financial savings. Is it somehow possible that the same pump used for sand transfer could also be utilised in the provision of the above suggested inflow? Additional benefits can accrue from the existence of a permanent sand transfer system. Your Study advises that there has been over recent years progressive widening of North Narrabeen beach which increases the volume of sand at the Lagoon entrance, with more extensive and frequent clearance and opening operations becoming necessary. Sand buildup has forever been occurring at the northern end of the beach, due to natural littoral drift transporting suspended sands from the southern (Collaroy) end. On irregular occasions storm-surge erosion at the southern end of the beach increases this sand loss resulting in the need for its rapid replacement. The existence of a readily available permanent system for the return of lost sand would therefore enable quick response as needed and assist resolution of three connected ongoing problems :- the entrance closure; lagoon sand buildup; and beach erosion. If found necessary, the excess northern sand could be pumped back south independently of any other lagoon management requirements. Regrettably it would appear too late to coordinate pipeline construction with stabilisation works currently being undertaken along part of the southern region of the beach. With regard to the suggested Ebb-Tide channel it is possible that the proposed semi-submerged training walls may adversely affect inflow and be somewhat counter-productive. They could also become a hazard for recreational pursuits. Should more frequent and controlled entrance openings and a more permanent sand removal and transfer system become available the need for such works may be negated. There are further issues associated with this matter. In the past, sand removal has extended only to a point generally in line with the eastern boundary of Lagoon Street leaving a large bank of sand upstream. Future works should be extended to remove this additional built-up sand. Previously suggestions have been made to remove the entrance rock shelf. This shelf acts as a weir controlling water outflow. It's removal would at low tides lower the water level of the whole lagoon resulting in exposure of formerly constantly submerged areas and seagrasses. This option should be rejected out of hand. There are some submerged oystershell encrusted rocks (remnants of the adjacent seawall construction) in the main entrance channel which should be removed for the protection of unwary swimmers. Whilst appreciating that Northern Beaches Council is seeking solutions to long-standing problems, your publication is only the latest of many similar ones put out by former Warringah and Warringah/Pittwater Councils jointly. These have been based on, or accompanied by, various reports prepared by independent consultants, special Council Committees and public

	submissions. They have however resulted in only minor changes to the basic principles of relying on rainfall and trucking. Some sand removal process improvements have however been progressively introduced. These include upgraded equipment and techniques, the creation of one-way truck movements, to reduce traffic flow inconvenience, and provision of perimeter silt control fencing to combat suspended sediment transfer, caused by tidal flow movement, for sea grasses protection. In this regard it was later found more practical to provide an entrance barrier (as per Photo '18 Oct 2018') to eliminate tidal movements thereby obviating the need for the erection and dismantling of the fencing. Regrettably, although some method adjustments resulted from submissions to previous Councils investigations, no advice, announcements, or follow-up publications were provided to the public of any decisions taken. Only observation at the time of the next works gave any indication of adopted management changes. It is time that the same old "Same Old" methods of "Pray For Rain" and "Bring In The Trucks" solutions were abandoned. It is earnestly hoped that your Council can finally determine and implement more suitable methods of dealing with these longstanding entrance management problems. Once Council's investigations are completed details of the results of your Study and intended future actions should be published. In appreciating the extensive costs associated with any manner in which these problems are resolved the former Councils' documents made reference to the possibility of State (and/or Federal ?) Government financial assistance for the overall project. Could that still be available ? I would appreciate the opportunity to meet with Council's officers to further discuss and explain my thoughts on these issues. I refer to my submission of 26th February re the suggested concept of creating an isolated section of the lagoon, by the provision of a sand weir near or upstream of the Ocean Street bridge, to assist with opening of the entrance. As an alternative to pumping seawater into the isolated dammed area via a "low flow" pipeline, a more suitable method may be to pump water from the remaining larger upstream section of the lagoon over the sand weir to achieve the required elevated level. Once again this is a matter for Council's hydraulics specialists to calculate volumes and levels to ensure no environmental damage is occasioned to either section of the temporarily divided lagoon. It could however result in the lagoon itself being utilised when needed to solve its own perennial problem.
11	I think that Council need to investigate as an alternative solution, moving the north embankment back of the Ocean Street Bridge - so then the lake/lagoon is more open to the ocean instead of going around a curve. This would bring the entrance back to how it was before the bridge - this is evidenced by early photos, as well as 'heresay' I've heard a few times, that having filled in the north side of the road into the lagoon to make the bridge shorter it has severely impacted the natural flow of water in and out of the lake/lagoon.
12	To whom it may concern, I would like to state my support for the 2019/07/04 Draft Narrabeen Floodplain Risk Management study, where they laid out a proposal to extend the bridge opening. This proposal could be a reasonable compromise to correct the blunder of the current bridge having been built in the wrong location and thus minimising the self scouring effects of the lagoon entrance. I have had the pleasure of living at [redacted] Ocean St back in the early 1990's, and speaking with the very elderly resident at [redacted] Ocean St who had lived there all his life. He informed me that the most recent bridge had been built on the south side of the opening to maximise the size of the camping ground area on the north bank of the lagoon, and the lagoon no longer drained properly. Hasn't Council now outlayed sufficient funds with repeated opening of the channel to realise it might be more cost effective in the long term to open up the drainage channel so it flows faster and more directly out of the opening, and would likely require less interference by man once it

	was returned to a state more closely resembling the original? One only needs to look at the older stock photos on the web to realise the original width of the opening and that the main body of deep water was heavily biased to the north of the lagoon arm. And if you have made it this far through my email, thank you for giving me the time.
13	Only 3 suggestions. 1. A 1 meter rock wall around the entire lake. 2. Raise the road height, by a meter, in the Wakehurst Parkway that floods all the time, 3. Dig a deeper trench at the lake outlet. In the last 2 floods, the water level has reached the same, several meter mark, from my garage door. I assume that is because that is the level height of the outlet to the ocean, possibly. It is all up to you if you want to fix the problems or just pass the buck.
14	Of course the lagoon will flood because it full of sand. It is so shallow you can nearly walk from one side to the other in some areas. My daughter has stopped using her paddle board in the lake because it bottoms out. The lake was always open or opened regularly to keep it healthy. Stop listening to minority green groups and dredge it get a bit of depth in the lagoon and maybe it wont flood as often. It will be able to handle heavy rainfall.

Document administration	
Version	3.0
Date	24 August 2021
Status	Draft