MARIA CREEK
SUSTAINABLE INFRASTRUCTURE PROJECT
COMMUNITY FOCUS GROUP
Question and Answer (Q & A)

These Q & A have been prepared to reflect the discussion held at the initial meeting of the Maria Creek Infrastructure Project Community Focus Group, held on Monday 17th August 2020.

1. **A submission provided in response to the concept study requested further information on the suitability of pumping seawater out of Maria Creek as a viable option. Why was this not progressed for further investigation?**

   Information on pumping of seawater was considered in the FAQ document in July 2020 (refer to Question 8). The subsequent community submission was considered through the presentation of Wavelength to the Community Focus Group.

   During the presentation, it was reiterated that all options put forward by the community were considered in detail and given appropriate assessment.

   The following key points were discussed in detail (extract from presentation):

   Pumping was considered but discounted due to:

   - *High operational cost, ~$1.2M per year;*
   - *Not effective at maintaining navigation:*
     - *Sand will continue to flow around entrance, forming an ebb tidal delta;*
     - *Channel position is likely to move depending on weather conditions;*
     - *Ebb delta can create dangerous wave conditions at entrance;*
     - *Dredging of entrance likely to be required at times of high longshore sediment transport (i.e. following storms).*

   Wavelength Response

   Seawater pumping is a 'novel' idea which has been put forward by members of the community, where seawater is pumped from the ocean to the landward side of the boat ramp within the channel. This increases flows out of the channel, aiming to clear the sand and wrack which has accumulated within the entrance channel. This type of pumping can be effective for management of environmental flows or to improve mixing in river and lake systems, however, utilising this method to maintain navigability is quite novel and is not a common approach.

   The volume of water that would need to be pumped to create a stable entrance is approximately 10 times more than water volumes flowing out during a natural, outgoing tide. Each tide, approximately 600,000 to 700,000 m^3 of water would be needed to be pumped to maintain a deep channel. Pumping this large volume of water would require extremely high power costs (in the order of $1.2M per year if connected to mains power). Whilst the operational costs could be reduced or offset by a renewable energy source such as solar or wind, these options require significant capital investment. Further investigation on these costs may be warranted if it was a more effective option, however this option is highly reactive and not considered an effective option for this location.

Sand will continue to flow around the southern breakwater and across the entrance channel even with a large scale pumping system installed. Given the higher discharge rates from a pumping system, the sand would form an ebb tidal delta across the entrance, as shown in the example below. The example is from a river system, which is on a much larger scale than Maria Creek, but indicative of the sediment formations that may be seen when the outflows are higher. The ebb tidal delta allows sand to move across the entrance channel, whilst maintaining high discharge from the creek. However, this sand formation creates navigation hazards and challenges at the entrances, including potential shoal waves, shallow bars and potential channel closures in storm conditions.

Even if seawater pumping could create a navigable entrance, there is little control over the sediment formation and subsequent hazards that creates. This would likely require a dredge to remove those formations, as well as during significant longshore transport events. This flow of sand and formation around the channel (ebb tidal delta) requires reactive management and it is likely that, at times, the channel entrance would be closed.

The community submission and this concept was put to the Community Focus Group who advised it had been adequately assessed and they did not require any further investigation into this particular concept.

2. Feedback provided in response to the concept study requested further information as to why a weir was not progressed for further investigation?

Information on a weir was considered in the FAQ document in July 2020 (refer to Question 7). The subsequent community submission was considered through the presentation of Wavelength to the Community Focus Group.

Wavelength Response
Both the community options for a weir, and pumping of seawater, were good options that have been put forward a number of times in the current study and previous studies.

It is important to note that every option put forward by the community was looked at in detail through the first pass assessment of this study, no option was dismissed or discounted without proper assessment.

In previous studies they may have been dismissed in a one-line sentence, and it was acknowledged that the community felt these warranted further assessment.

The following key points were discussed in detail (extract from presentation):
Weir was considered but discounted due to:

- *Ineffective at managing sand accumulations in creek:*
  - *Sand will continue to accumulate south of breakwaters and flow across and into the creek entrance.*
  - *Creek discharge, even with the weir, not expected to be sufficient to clear entrance.*
- *Ineffective at managing wrack accumulations in creek:*
  - *Weir doesn't stop storm wave and wind energy, which are the main drivers of wrack movement into the creek entrance.*
  - *Wrack likely to continue to accumulate downstream of weir (near boat ramp).*

The weir concept is another 'novel' idea where a weir is constructed upstream of the boat ramp in an attempt to reduce the tidal flows on the incoming tide, and increase the outgoing tidal flows, with the aim of flushing the entrance channel.

Whilst the weir may reduce the volume and speed of incoming tidal flows during ambient conditions, it would do little to effectively manage the accumulation of sand on the southern side of the breakwater or to stop sand movement across the entrance channel. Even with increased discharge from a weir, an ebb tidal delta would likely form at the entrance and require ongoing management through dredging. Additionally, a weir would do little to minimise the wrack accumulation in the channel from a north to north-west storm event.

The feedback for further clarification on why this concept was not progressed was put to the Community Focus Group, who advised it had been adequately assessed and they did not require any further investigation into this particular concept.

3. **A submission provided in response to the concept study requested assessment of whether a 'wave attenuator' (similar to Port Lincoln) could be installed to provide a level of protection at an alternate boat ramp location, such as Johnston Ave?**

One idea presented was whether a wave attenuator placed offshore of an alternate boat ramp location could help to reduce wave energy and surging effects in Kingston. One of the suggestions put forward was a wave attenuator similar to that installed in Port Lincoln.

The submission was provided to Wavelength prior to the meeting and its suitability was considered and presented to the Community Focus Group.

Wavelength Response

Some context to the Port Lincoln wave attenuator is provided below. In early 2014, Port Lincoln City Council installed a pontoon swimming pool adjacent to its town jetty. A severe storm from the north damaged the pontoons in September 2014. An ad hoc wave attenuator, consisting of 3 dismantled aquaculture rings (made of 0.6m diameter poly pipe), was installed to provide some temporary protection for the reconstruction of the floating pontoons. The rings float on the surface, extending less than 0.5m below water level, and are tied to concrete blocks on the sea floor. Following the repair works, Council secured the attenuators to provide longer term protection from the critical northerly wave events.

The Port Lincoln pontoon swimming pool and wave attenuator are at the southern end of a large bay, which offers excellent protection from offshore swell waves. However, the structures are exposed to an approximate 10km northerly fetch, which means short period wind waves (period of 3 to 4s) can be formed when strong winds blow from the north. These short period, northerly waves are the critical case for the pontoon structures and as such, the installation of the 'informal' wave attenuator aims to protect from this very specific weather condition.

The key difference between Port Lincoln and Kingston, is that the Kingston shoreline is more exposed to the open ocean. This means that longer period swell and sea breeze waves can form over the very long fetches to the west and north-west. These waves can have a period more than 10 seconds at times.

Why does that matter? The longer the wave period, the more energy a wave has and the deeper the wave energy moves in the water column. For short period waves (3 to 4s), a lot of the wave energy is in the surface, which is why the floating wave attenuators work well for the northerly waves at Port Lincoln. With longer period waves (6 to 10s), a lot of the wave energy passes at depth (well below the surface), which means that a shallow wave attenuator, like at Port Lincoln, will do little to stop the effects of swell moving underneath the attenuator. This is the main reason that a relatively informal, low cost attenuator is unlikely to be effective at stopping swell waves or westerly sea breeze waves in Kingston.

A more formal wave attenuator, which extends to depth (half of the water column), could be installed to reduce longer period wave heights at Kingston. These types of systems exist, however they are typically rigid, strong structures (generally with piles), with an associated high cost. The effects of this type of attenuator on the natural coastal processes would also need to be considered. For example, any attenuator that creates a wave shadow (reduced wave energy) is likely to accumulate sand behind the structure. While it may help to reduce the swell and sea breeze waves, it may create a sediment accumulation issue at the ramp itself.

In summary, there are attenuators to reduce the effects of waves, however a simple attenuator like at Port Lincoln may not hold up in the conditions at Kingston. Something more formal may be more effective, however the cost and potential impact on the coastal processes would need to be assessed.

At the request of the Community Focus Group, a formal assessment of the effectiveness and cost of a suitable wave attenuator will be undertaken and presented at a future meeting.

At the conclusion of the presentation by Wavelength, Community Focus Group members provided questions for discussion. The following questions and responses were discussed during the meeting:

4. **Johnston Avenue is considered a stable location within the bay, and existing concrete slabs installed from many years ago have not moved. Could a concrete slab be installed from the high-water mark, and utilise the existing pontoons from Maria Creek down the centre in conjunction with a wave attenuator same as Port Lincoln? Propose the pontoons could come out in the winter months. This would provide a 2-lane boat ramp with any sand build up on the concrete to be removed by loader. (GU)**

Wavelength Response
The concept study provides that a formal over the beach ramp with concrete panels (Service Level 2 ramp) is not recommended, as it is likely to become saturated with sand (similar to a hard breakwater structure), requiring frequent removal of sand accumulation at the toe of the ramp. To prevent the ramp from being undercut by beach erosion, the ramp would also need to be protected by a deep seawall structure. This seawall structure is likely to trap sediment on the southern side, like a groyne, leading to erosion on the northern side of the ramp. Regular sand bypassing would be required to prevent this sand build up and associated erosion.

As addressed in Question 3 of this Q & A, a relatively informal wave attenuator is unlikely to be effective in mitigating the wave and swell at the Johnston Ave location. Attenuators can be designed accordingly but may need to be a significant structure with an associated significant cost.

As we know, the Kingston shoreline is open to ocean swell, which can create surging effects on the beach, making beach launching difficult. To counter that surge, any effective attenuator would need to extend

quite deep below the surface. Even an attenuator extending to half of the water depth may only stop 40-60% of the wave energy, with the remaining wave energy passing underneath the attenuator. This may not be effective in all wave conditions. Additionally, the attenuator length is important and would need to be at least one wavelength long (i.e more than 60m long). An average wave in Kingston would likely 'wrap around' a short attenuator structure.

The structure required (being a fixed, hard structure essentially acting similar to a breakwater) would have a significant impact on the sediment transport pathway, which in turn creates a sand management issue. While it may reduce the wave energy, it will likely stop sand movement to the north and would need to be removed from the structure once settled. The success of an attenuator structure required in Kingston would depend on that management strategy.

A floating attenuator system would be unlikely to mitigate swells or surges as seen in Kingston. Therefore, a floating attenuator only covering 0.5m of water, like at Port Lincoln, wouldn't be suitable to stop longer period waves in Kingston.

Information on whether the pontoons from Maria Creek could be utilised at an alternate location was considered in the FAQ document in July 2020 (refer to Question 9). The pontoons from Maria Creek are not designed for open ocean conditions and are only appropriate within calm and protected waters. As such, they would likely be damaged in the open coastal environment without a protection structure. Any hard, breakwater style, protection structure is not recommended for the same reasons and issues that are seen at Maria Creek and Cape Jaffa.

5. **Would the informal wave attenuator help reduce the south easterly sea breeze cross shore waves as seen regularly in January?**
Generally, an afternoon sea breeze of 20 knots SE, which is around 45 degrees offshore at Johnson Ave so something informal to help stop the sideways chop and hopefully make it a lot easier for people retrieving in the afternoon. Most unlikely to go fishing in a strong westerly, so even if it could help reduce waves from the afternoon sea breeze. (JB)

Wavelength Response
Firstly, it needs to be ascertained as to what direction or event an attenuator is trying to minimise. For a cross-shore sea breeze with a relatively short fetch (a few kilometres), an informal attenuator, such as the option used at Port Lincoln, may be able to attenuate or reduce that wave energy. If offshore wave energy, such as swell or a westerly sea breeze is the main problem at the site, then an informal attenuator structure is unlikely to reduce these waves. Any informal wave attenuator would need to be removed over the winter months to prevent storm damage.

Based on the 'wind rose' from BOM for 3pm at Cape Jaffa, it suggests that the afternoon sea breezes are mainly from S/SW. This will be further quantified in the formal assessment of the effectiveness and cost of a wave attenuator at Kingston.

6. **Our dredge can't handle fresh weed, so an excavator is required to remove the wrack from the creek. An excavator could remove sand and weed in the channel if you remove the southern groyne back to the level of the northern groyne and narrow it to 12m. Did you take into account excavating costs within the concept study? (SG)**

   Wavelength Response
   Yes, the costings in the concept study include allowance to use an excavator to remove sand and wrack within the capital dredging campaign, with an ongoing allowance to use an excavator to remove wrack from within the creek. The costings provided for wrack management are based on using an excavator only, then based on a dredge for sand around the entrance and to the south of the breakwater.

   If you narrow the channel to 12m and bought the dredge down at the right time of the year (eg December when our winter weather is over) and dug a nice deep channel right out to sea, do you think the channel will just fill in? (SG)

   Wavelength Response
   Yes, unfortunately without removing a significant volume of sand on the southern side of the breakwater, any excavated channel will fill in very quickly due to the sand flow from south to north across the entrance. Given that we are looking at between 30,000m^3 to 50,000m^3 of sand moving in a net northerly direction each year, any channel will fill very quickly and/or cause a bar formation as currently seen.

7. **If you were to get rid of half the groynes and there is 200m of wrack built up in the creek, do you see all that moving further up the creek to the bend? Will it block further up the creek if half the breakwater is removed? (JB)**

   Wavelength Response
   Historically the wrack has mobilised around the corner within the creek, even under the current arrangement. Therefore, it could potentially continue to mobilise that way regardless of whether we remove the breakwaters or not. By removing the end of the southern breakwater there might be a larger inflow of wrack due to the slight increase in exposure to westerly storm events, but the net effect is likely to be similar in the long run.

8. **Kingston to Cape Jaffa was one of the safest beaches for kids and families but isn't anymore. The beach and depths have changed and isn't safe for launching anymore. We are seeing breakers and swell we have never had, the whole system has changed and no seagrass build up in winter months. A lot of comments that the seagrass is gone, but is it just covered in sand? (EL)**

Wavelength Response

The observation that there has been a significant shift over the past 4 or 5 years was brought up by the community through the engagement sessions. This was confirmed in the analysis and investigation phase of the concept study, as well as through a subsequent project (being the Kingston Coastal Adaptation Strategy).

It appears there has been a loss of seagrass within Lacepede Bay, and there is some uncertainty as to why that loss of seagrass has occurred. It is thought to have been affected by outflows from various drains along the Kingston coastline, including Maria Creek, with increased loss of coverage due to poor water quality from these outflows. We found that the loss of seagrass is causing more sediment that was previously rooted and stable, to be mobilised and therefore more sediment is readily available to move within the system because of that loss of seagrass.

Climate change may also be having an impact on seagrass loss. Changes in water temperatures, nutrients and acidification could be impacting on different seagrass species. Additionally, increased water depths due to sea level rise and increased storminess (frequency of storm events) may have an effect on the survivability of certain species of seagrass.

Climate change may also be affecting the predominant weather patterns and wave climate. Even a slight change to the approach angle of waves to the coastline can have massive impact on the sediment transport rates. As sea level rise occurs, we will likely see significant shift in how our systems work. We have seen significant changes in most coastal systems over the past decades and will likely witness significant shifts into the future.

Additionally, there is a lot more sediment moving in the system. In particular, the 2016 events, including the 1 in 50-year July 2016 event, caused a significant amount of dune erosion, creating a highly mobile "sand slug" in the system. The effects of these 2016 events were seen all around South Australia, resulting in significant changes to sediment erosion and accretion. Sea level rise is likely to see those types of events happen more frequently, resulting in more erosion and sand in the system.

The loss of seagrass, the causes, and its effects on sediment transport, is a highly complex process with several conditions combined.

9. The Service Level 3 ramp provided as an example in the concept study, is that open to the west or does it get much weather in winter time? (JB)

Service Level 3: Piled over the beach boat ramp

Wavelength Response
The example Service Level 3 from the concept study is located at Port Kennedy in the City of Rockingham, Western Australia. It is considered that the location is a similar orientation to Kingston, and is open to the north (ie north facing ramp). Some nearshore reef systems provide some protection from ocean swells, but generally seabreezes are cross-shore or offshore.

Wave surging from ocean swells can be a problem in winter, even with the jetty structures assisting with boat launch and retrieval. Users need to be careful under certain surging conditions. Careful management through signage and community education has been implemented.

Generally, the piled over the beach ramp and jetty works quite well but has a relatively high capital cost of approximately $5.0-$6.0M and a 25year NPV of around $11.0M. Wrack needs to be managed and acted on quickly, as any wrack that builds up underneath the ramp will trap additional wrack and result in sand accumulation/siltation build up at end of ramp. It can be designed to be relatively flexible and withstand extreme events.

Without proactive wrack and sand management it would effectively act as a groyne, so would need to have a robust management plan to ensure that sand accumulation and wrack is managed. It is achievable (at a cost) but ongoing management is extremely important.

10. The concrete ramp at Johnston Street is still fairly stable and a good base for a concrete ramp over the top and to set up wave breakers. (GU)

Wavelength Response
Building an 'ad hoc' ramp on top of the existing Johnson Ave concrete ramp is not recommended, as it would likely fail from storm erosion and pot-holing. This has been seen at the current location and existing concrete ramp, as Council needed to remove the end of the existing slabs due to damage from swell and storm events.

Beach erosion has undermined the panels and slabs at the end of the ramp causing hazards to users. To prevent a new concrete ramp from being undercut by beach erosion, the ramp would need to be protected by a deep seawall structure.

As noted previously, a large seawall structure is likely to trap sediment on the southern side, like a groyne, leading to erosion on the northern side of the ramp. Regular sand bypassing would be required to prevent this sand build up and associated erosion. As such, a Service Level 2 concrete ramp is not recommended, as it is likely to become saturated with sand, requiring frequent removal of sand accumulation at the toe of the ramp.

The effectiveness of a wave attenuator has been considered in previous responses in this Q & A, and at the request of the Community Focus Group, a formal assessment of the effectiveness and cost of a suitable wave attenuator will be undertaken and presented at a future meeting.

11. Would the example shown in Service Level 3A (DPTI Service Level Categories) be able to be built at Johnston Ave? Example from Blackfellows Caves (appears to be fixed piles with floating pontoons but unable to determine from photo). (SG)

Service Level 3A example (Blackfellows Caves)

Ramp location: Blackfellows Caves

Wavelength Response

The location (Blackfellows Caves) is different to Kingston in a number of ways. Blackfellows Caves has some reef and relatively shallow water nearshore, so it appears to have reasonable protection from swell waves. Additionally, the site is tied into a rocky headland and there appears to be much less sand movement in the immediate vicinity.

The main issue when comparing this to the Johnston Ave location, is the difficulty in designing a ramp structure which will accommodate erosion (to withstand a 20 year storm event) without impacting on sediment transport in the area or requiring on-going sand bypassing to keep the ramp open.

12. If we pull down some of the existing breakwaters, will that make any difference to the Johnston Ave area as far as sand goes? (CE)

Wavelength Response
Based on historical aerial photos, the accretion front (sand accumulation) is still north of the location (near Thredgold Ave) and it hasn't made it to Johnston Ave yet. Therefore, we wouldn't expect that the removal of the breakwater would affect Johnston Ave. It would, however, reduce the width of the beach from Thredgold Ave to Maria Creek where that accretion has occurred.

13. If you left the breakwaters there, eventually it would affect the Johnston Ave location? (SG)

Wavelength Response
If you leave the breakwaters in place (under the 'Do nothing' approach in the concept study), eventually the accretion front will reach the Johnston Ave area. The accretion front can be seen on recent aerial photographs as a seaward movement in vegetation line position. An example from Google Earth is below:

With ongoing time, under a 'Do Nothing' approach, sand will continue to accumulate further south and eventually reach Johnston Ave. It appears the accretion front is within 1km of Johnston Ave and as the accretion front moves south, more sand is required for the beach to widen. This means the accretion front will slow as it progresses south due to the volumes of sand required and could be a number of years before it gets to Johnston Ave. However, that is why a formal Service Level 3 ramp at Johnston Ave would not be recommended under the 'Do nothing' approach, but is recommended if you remove the breakwaters under Concept 4.

14. What hasn't been mentioned is the obligation of the Council to remove the sand from one side to the other, both here and at Cape Jaffa. How come that wasn't in the report and what is the obligation? Why hasn't it been done and who is responsible? Why isn't anyone liable for not moving the sand? (MW)

Wavelength and Council response

The obligations for sand bypassing and historical management was not in the scope of the brief for the Maria Creek Sustainable Infrastructure Project and was therefore not considered by Wavelength in the preparation of the concept study report. The concept study report considers that the future risk mitigation is that Maria Creek is kept open for environmental purposes, including flood risk mitigation.

The Cape Jaffa situation is different to the Maria Creek in that there are legal obligations within historical legal agreements, which are quite complicated. Council are going through a process to try and unpack those legal agreements, but that is a different consideration to the obligations at the Maria Creek facility. It is acknowledged that whilst one impacts on the other, and our affordability of one impacts on the other, we have been undertaking our obligations to maintain Cape Jaffa and ensuring that the developer is also maintaining their obligations. It is very hard to compare the legal obligations when considering a commercial development, with a professional fishing fleet and legal agreements in place, when we don't have the same legal obligations at the Maria Creek facility.

Retrospectively dwelling on obligations doesn't help the situation now, and we are continuously hearing about the changes in the coast, the severe events and the challenges these create. Council couldn't afford to move the level of sand required due to those significant events. Council is trying to go back a step to understand, plan, and manage it moving forward. That includes understanding the effect on businesses and facilitating a discussion with the business community.

As a result of discussion and key items, the following matters will be progressed for further investigation by Wavelength and consideration by the Community Focus Group:

- Formal assessment of the effectiveness and cost of a wave attenuator at Kingston;
- High level review of Service Level 2 ramp management and costs;
- High level review of Service Level 3 example from Blackfellows Caves and feasibility at Kingston;
- Review of temporary panel options.