# TRAMWAY SHARED PATH AND SEAWALL UPGRADE

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## Introduction

The Tramway Shared Path and Sea Wall upgrade is Council's most recent stage undertaken as part of the Blue Mile project. The Blue Mile project comprises of promenades and walkways which connect key locations along Wollongong's coastline, these offer both amenity and beauty along the foreshore. The Blue Mile runs from Stuart Park in the north, to Wollongong Golf Club in the south.

The Tramway project included a new sea wall consisting of 150 precast concrete panels, rock scaling and bolting, kerb and gutter, stainless steel fencing and concrete pavement, which incorporated 8,500 pavers and 19,000 individual cobble stones.

### *Blue Mile Master Plan*

The vision of the Blue Mile Master Plan is to provide a high quality, popular and beautiful open space area that links the city centre to its magnificent foreshore, and provides a substantially enhanced amenity for residents and visitors.

Objectives include:

- Establish high quality open space,
- Improve pedestrian/cycle access to and along the foreshore,
- Provide high quality facilities of distinctive local design that respond to and enhance the unique natural environment,
- Provide a range of facilities for families, visitors and local residents,
- Ensure design proposals maximise the safety of visitors,
- Improve vehicular access and parking opportunities,
- Integrate public art into design proposals.

Council has been working on the Blue Mile project since 2006. Prior to the start of works on The Tramway project, Council had delivered 12 other key stages of the Blue Mile as funds became available.

The Tramway project represents one of the key links in the Blue Mile and connects the beautiful Belmore Basin to the iconic North Beach. Along the way The Tramway passes the Wollongong Continental Pool and the historic Gentleman's Bathing Pool.


**Figure 1 – Site Location**

***Tramway Project***

The Tramway section of the Blue Mile sees around 14,900 pedestrians and 2,690 cyclists pass through the area every week. The existing asphalt path was narrow and split into a dedicated cycleway and footpath area. On a daily basis, this creates conflicts between high volumes of pedestrians and, at times, fast moving cyclists trying to navigate the narrow space.

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**Figure 2 – Existing Path 1**

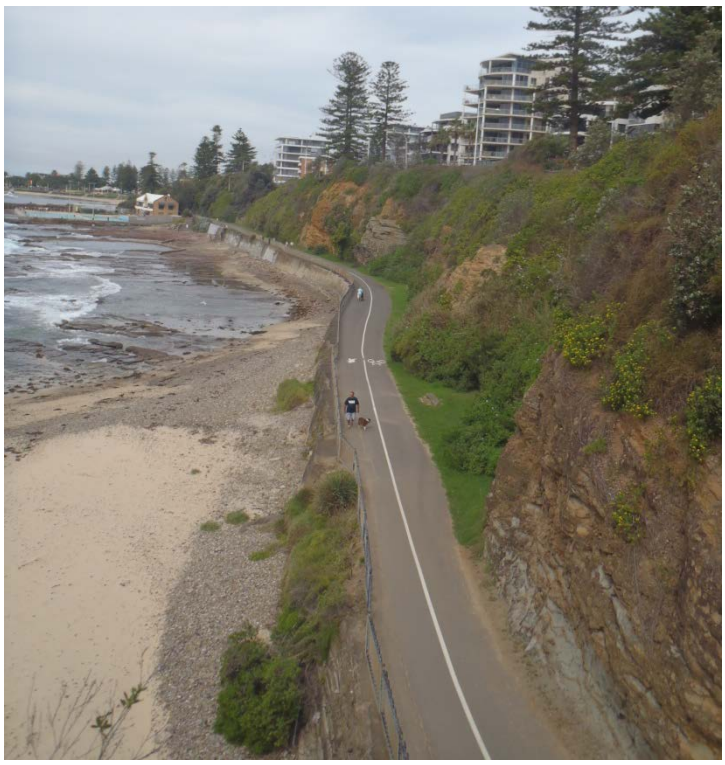

**Figure 3 – Existing Path 2**

The existing seawall was a stacked stone wall which was built around 1862 to support the creation of a tramline between the Mt Pleasant Mine and the coal loading terminals at Belmore Basin. Due to the tidal and wave action on the wall over time, rocks have been washed away and large voids created behind the wall. These voids created structural issues for the seawall and path above.

**Figure 4 – Voids in Seawall 1**


**Figure 5 – Voids in Seawall 2**

Council has a long history of repairing the sea wall by filling voids with concrete and applying shotcrete to the surface of the wall to avoid further void creation.

**Figure 6 – Shotcrete Wall Repair**

The condition of the seawall and issues relating to the path width and operation needed to be addressed as part of the upgrade project.

## Site History

The Tramway was originally a constructed platform for the rail link between Mt Pleasant Mine and the coal loader jetty at Belmore Basin. The tramline was built around 1862. The line operated until 1938 when the tracks were removed and the surface covered with asphalt. The path carries great historical significance for the industrial operations of the Wollongong area. The seaward face of the wall was a 350m long stacked stone wall which was exposed to coastal erosion through direct wave and tidal action.


**Figure 7 – Original Sea Wall**

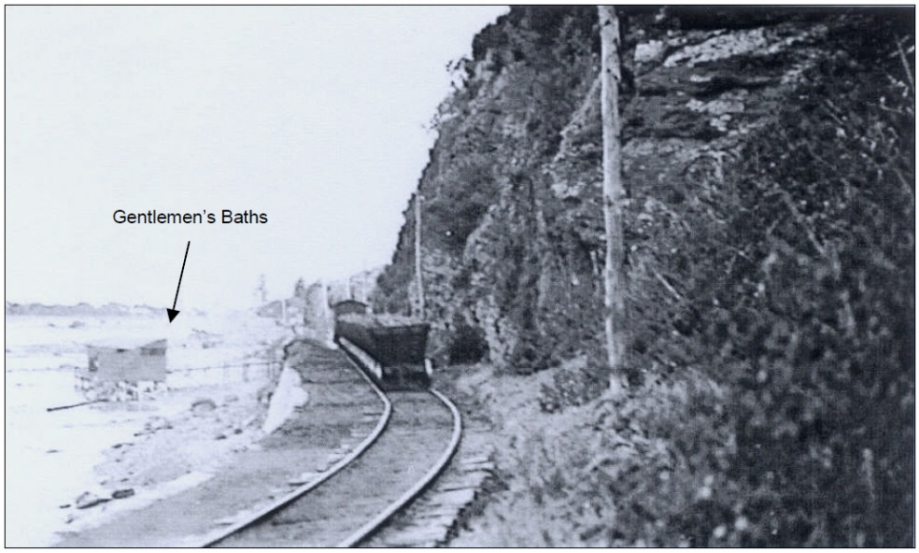


**Figure 8 – Original Tramline**

The tramline also passed by the Gentleman's Baths and associated pool which were formalised in the 1890's. The pool is still in operation today and timber footings of the original bath house can still be seen on the rock shelf.

**Figure 9 – Gentleman's Baths**

A heritage study of the area also found aboriginal artefacts and deposits within the proposed project area. These included a rock shelter, axe grinding grooves and middens. The project needed to ensure all of these elements were maintained and protected during the construction.

## Design Considerations

As part of the design development for the project Council undertook a series of geotechnical, structural and heritage investigations. These investigations helped determine constraints and requirements for the project. Some of the requirements which were factored into the design were;

- Replacement of the existing sea wall. Repair of the existing wall would not create the desired design life for the project and result in major impacts on the heritage wall.
- The existing wall needed to be photographically recorded and if possible preserved onsite.
- Footings of the old Gentleman's Baths were to remain undisturbed
- Locations of Aboriginal significance were to remain undisturbed.
- The existing rock faces above the site and through the northern cutting needed to have lose rock removed for safety of future users.

After determining the above constraints, a large scale community engagement process was undertaken to obtain feedback from the users of the path. This engagement was done to determine how people used the space and how they would like to see it improved. The outcomes of the community engagement process provided the following information;

- A desire to slow down cyclists.
- Additional separation between pedestrians and cyclists.
- Lighting to improve safety after dark.
- To keep the Continental Pool open during construction.

The project also had to factor in the requirements of a $900,000 grant which was provided by Federal Government as part of their National Stronger Regions Fund.

## Design Solutions

### *Replacement of the seawall*

The design needed to incorporate a seawall capable of resisting significant coastal action in a highly aggressive environment, whilst providing community amenity and preserving the historical nature of the site. It also had to be constructible in a tidal zone and have material brought to site using a very narrow access way at the southern.

Due to the heritage nature of the wall and its significance to the local coal industry it was determined that its removal from site was not an option therefore a solution to protect the existing wall needed to be determined. After a review of the site the proposed options, it was determine to build a new wall in front of the exiting wall. This ensured the wall remained in place and would be protected into the future. This protection included covering the existing wall in geofabric to ensure backfill behind the new wall did not cause further damage. A photographic record of the wall was also undertaken prior to the start of construction for historic records

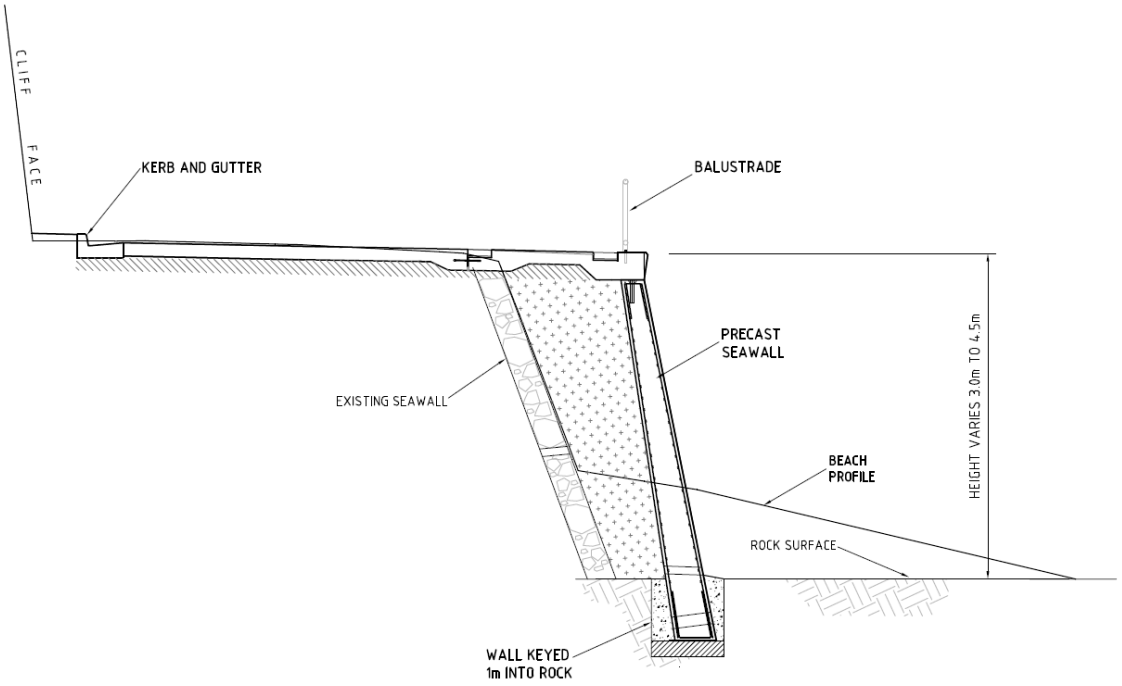


**Figure 10 – Typical Seawall Sections**

Options to connect the new sea wall to the existing rock shelf were investigated. The rock shelf along the length of the wall is made up of a low strength Bulga sandstone. The surface of the rock was uneven, this made using dowels and placing the wall directly on the surface very difficult and susceptible to water access under the panels through voids create in the grout over time.

To avoid this risk and ensure the panels could not be undermined before the end of their design life a trench was cut into the rock shelf. This provided a flat base for the

panels, consistency of grouting and additional toe support to help long term stability under wave action.

During the design Council obtained approval to undertake trial trenching to determine the best method and most environmentally sustainable way to excavate on the rock shelf. This trial looked at multiple cutting blades attached to an excavator. Council investigated the condition of the side of the trench, amount of fines created, size of the rock coming out of the trench and also the noise and vibrations caused by each of the different blades on the adjacent residential and commercial buildings.

The outcome of the trial was to specify that the contactor use a 10mm diamond blade to cut the trench. This method provided the least amount of fines on site and created larger rock from the trench which could then be used as toe protection for the new wall. It also ensured the works stayed within noise and vibration limits for the adjacent buildings. With noise and vibration within allowable limits Council was able to provide approval to work longer hours so the contractor onsite could better schedule around the tides whilst digging the trench and building the sea wall.

**Figure 11 – Rock Trench with Bedding**

During the design of the pre cast panels Council looked into the use of stainless steel bars. As the panels are exposed to regular wave action Council decided to look at alterative reinforcements which were not subject to attack from salt and water. Working with Royal Haskoning DHV a solution of using Glass Fiber Reinforced Polymer (GRFP) reinforcement was proposed. The GRFP is expected to outperform stainless steel which will result in less long term maintenance and overall better life for the panel in this coastal environment.

***Improved User Amenity and Safety***

The added benefit of the new wall location was the widening of the existing shared path. Widening the path allowed for an increase in width provided for commuter cyclist / fitness people and tourist / families. This has significantly improved the functionality, safety and feel of the path.

With the extra width of path Council undertook a detailed option assessment of possible path configurations. This was undertaken due to the high level of interest from the community on the long term use of the path. Multiple options were developed and assessed for their pros, cons and link to the surrounding shared path network.

Assessment of the options determined that re installing the cycleway lane and allowing cyclist to travel a high speeds was not a desirable outcome for the area. The high number of tourist, school groups, and leisure users, coupled with the fact that it was only a short section of the greater shared path network determined that a dedicated cycleway would create erratic behavior and create safety issues at the cuttings at each end of the project were users needed to merge together into a shared path configuration.

The final outcome of the assessment was to create a shared path networks along the entire length of the path. Where the path width permitted and additional area was created for leisure users. The shared path helps control cyclist speeds but still allows them to safety use the area.


**Figure 12 – Shared Path and Seating Area**

To delineate the different areas within the path and ensure the surface finishes could withstand the environment it was decided to use multiple surface pavements. The main section of path was constructed using honed concrete. This matches the concrete used in the adjacent sections of the Blue Mile. The shared path section, which was located on the cliff side in wider areas, was constructed using a honed oxide concrete to create a darker look and show it as a difference zone. Paving was also used to define areas where paths merged or changes. These included the area at the northern cutting and behind the Continental Pool, were there are multiple building entry points and a set if steps leading up to the adjacent road.

Using the different pavements allowed the creation of a paving band which ran along the length of the job. The line was created to signify the old tram line. The paving linked to the lines created in earlier stages of the Blue Mile which followed the old train lines though the area. This is an important feature of the project as it helps keep the heritage of the site visible to all users and tell the story of the path.

### *Rock Scaling*

The cliff above the path and northern cutting had large sections of exposed rock which was highly weathered and fractured. The rock would frequently break off and fall onto to the path. To improve the safety from falling rock and reduce ongoing maintenance Council's Geotechnical team worked through a process of rock bolting and scaling. Large volumes of small rock were removed from the site. Larger rocks which fell off the face of the cliff were lowered onto the rock shelf for use as rock armor for the new wall. Other large rocks which were not ready to fall were bolted on the cliff to keep them in place. The timing of this work was done prior to the start of the pavement construction. This avoided the need to move heavy machinery over the new pavement in the coming years, stopped large volumes of rock falling onto the new path and reduced long term maintenance for Council's cleaning crews.

The exposed rock surfaces have undergone re-vegetation to help lock the remaining rock in place. All this work on the cliff face required a heritage approval as the cutting formed part of the old tram line heritage listing.

### *Other Design Items*

Other key features of the design which were included to ensure the long term performance and safety of the path were;

The use of the stainless steel hand rails and reinforcement in all concrete other than the pre cast seawall panels. The stainless steel ensures minimal corrosion within the concrete slabs and on the handrails. Powder coated or galvanised handrails would require more frequent maintenance and have a shorter design life.

Lighting and CCTV have been installed along the entire length of the path. Pedestrian counts and community feedback showed many users were on the path before sun rise and after sun set. To improve safety street lighting and CCTV was installed. This ensures users can access the path at any time of the day.

The surface finishes, incl fences, seating and signage have been designed to allow for overtopping during large seas. This ensures the path can withstand king tides, large swell events and is future proof for any rise in sea level.

***Approvals***

To ensure minimal impact on the surrounding environment the design and construction methods needed to use innovative solutions to replace traditional construction systems. These solutions also needed review and approval from;

- NSW Heritage Office
- Department of Primary Industry
- Crown Lands License for areas outside the LGA
- OEH, who undertook regular environmental audits during the construction phase of the project

## Construction Innovation

As part of the construction of the new wall, Council contractor, Ertech built a temporary access road along the rock shelf in front of the new sea wall. The use of the access road was approved by OEH. The road was built of geofabric laid over the rock shelf and covered in basalt, allowing machinery to access the rock shelf without causing any damage with their tracks. The basalt in combination with protective mats ensured that the heritage timber footings of the old bathers sheds were protected for the duration of works.

The outer edge of the track was held up using jersey barriers which also created a bund to keep the tidal water out of the job. Although the bund did not keep all the tidal water out, it did increase the number of hours the contactor could work on the rock shelf each day. This resulted in Ertech being able to finish the project ahead of their contract schedule.

Once the wall was build the basalt was picked up and placed behind the wall as part of the no fines back fill as a duel use of the material onsite. The geofabric was then removed from site and the rock shelf left undamaged.

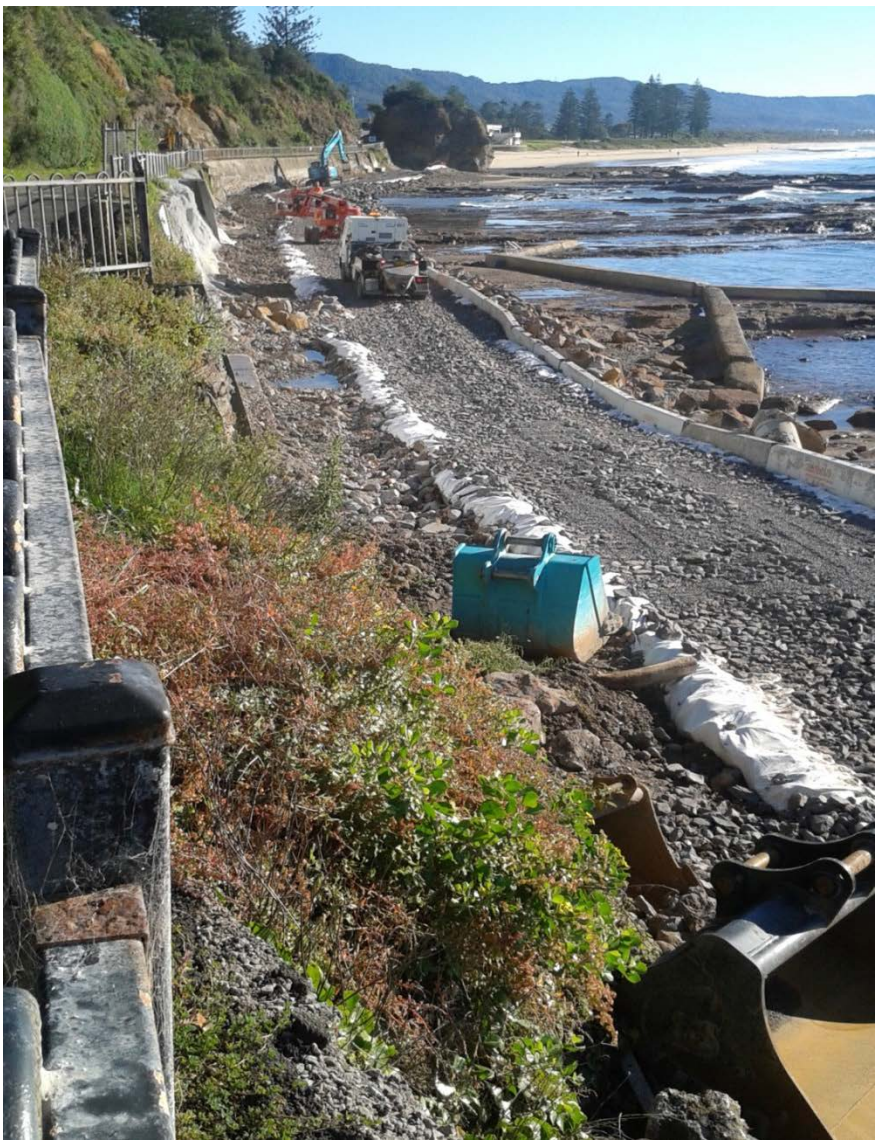

**Figure 13 – Temporary Access Track**

## Post Opening Feedback

Feedback from the community after the completion of the project has been overwhelming positive. Due to the extra width and replacement of the old cycle lane with a shared path users feel safer and are a lot happier to use this area of the foreshore. The Tramway now links with the rest of the Blue Mile project making the area more attractive for tourists which will aid Wollongong's economy into the future.


**Figure 14 – Aerial Photo of New Sea Wall and Path**

## Summary

Council has been able to successfully deliver another key piece of infrastructure within the Blue Mile. The new sea wall and path ensure long term stability for the area, reduce post storm maintenance and risk to the public.

The new path has significantly improved the amenity of the area for local user and tourists.

## References

Comber, J. & Appel, T., 2017, Aboriginal Archaeological and Cultural Heritage Assessment, Wollongong Beach Precinct “C”

Comber, J., 2008, Statement of Heritage Impact, Wollongong Beach Precinct “C”