Mount Edgecumbe – Cremyll Quay Strengthening Options

A topographical survey and preliminary soils investigation have now been undertaken for this site.

Following a discussion with the Engineering Soils Laboratory (ESL) preliminary investigations have revealed rock at a level of 94.500m AOD, which is approximately beach level. However this is at the borehole 5m behind the face of the wall (in the damaged area), and we believe the rock level may be falling seaward, to an estimated 0.5m below beach level.

A further borehole 4.7m west indicated a lower rock level of 93.000m AOD, which may also have an impact on the true rock level. Unfortunately boreholes could not be taken at the base of the wall to confirm rock level there due to the tidal conditions and lack of available low water time.

A number of possible strengthening options were discussed though there was some concern regarding the likely bearing pressure available which could make a standard mass concrete retaining wall unsuitable. The options considered were:

Option 1 – Rebuild existing wall on current alignment
Option 2 – Rebuild existing wall on concrete foundations
Option 3 – Masonry faced piled retaining wall on new alignment
Option 4 – Change quay into a revetment
Option 5 – Precast Concrete Retaining Wall Units

The rock is mainly limestone with which ESL have little experience due to its low occurrence in Cornwall – thus further explorative tests may be required.

The major constraint for the works is the tidal working as the typical low tide levels are close to the base of the wall, thus there would be limited working time without the use of some form of cofferdam or bund. A sheet piled cofferdam would give the most working time but would be expensive and require further investigations to ensure it could be driven into the rock. A further constraint is access, as there is no way for plant to access beach level without the use of a crane or perhaps forming a ramp down from the top. All these issues could increase costs so it is important to choose the most suitable option for ease of construction as well as a good final structure.

Consideration should be given to whether it is essential to maintain the original alignment as the site is within the following:

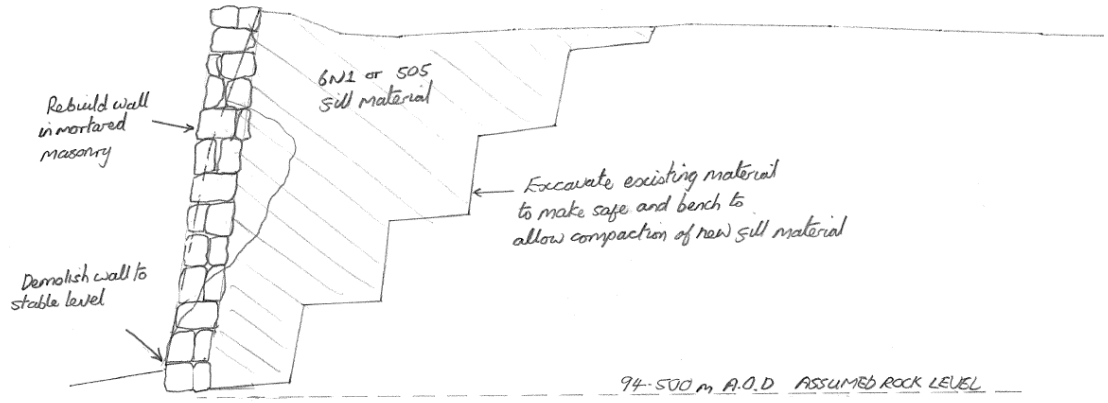
- Conservation Area
- Area of Special Advertisement Control
- Area of Great Landscape Value (AGLV)
- Area of Great Historic Value (AGHV)
- Special Area of Conservation (SAC) (*below Mean Low Water Level*)

Option 1 – Rebuild existing wall on current alignment
This option would involve demolishing the existing wall to an extent that makes the site safe for the required construction work and down to a sufficiently stable level to rebuild on. Benching of the existing fill would improve safety and aid compaction of new fill material.

Due to the high tide level and relative lack of a low tide beyond the extent of the works, it is most likely that some form of cofferdam or bunding will be required. This could be in the form of dumpy bags or sheet steel piled walling system. The working area would require pumping to maintain some form of practical working environment.

The new wall would be rebuilt in mortared masonry using as much existing stone as available and backfilled with a 6N1 material or possibly 505 drainage material.

Pro's: *Construction type unchanged. Bearing pressure remains the same.*
Con's: *Potentially subject to erosion as original. No additional protection. Protecting exposed works from tidal action during construction.*



OPTION 1 REBUILD EXISTING WALL ON CURRENT ALIGNMENT

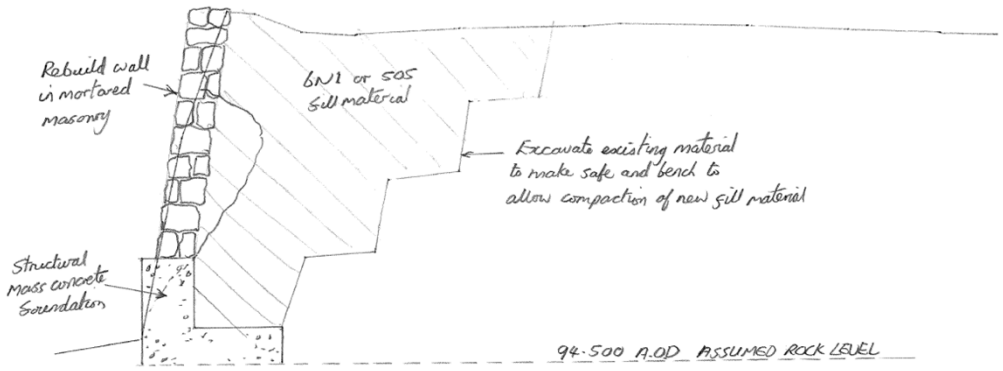
Option 2 – Rebuild existing wall on concrete foundations
As above, this option would involve demolishing the existing wall to an extent that makes the site safe for the required construction work and down to a sufficiently stable level to rebuild on. Benching of the existing fill would improve safety and aid compaction of new fill material.

Again, due to the high tide level and relative lack of a low tide beyond the extent of the works, it is most likely that some form of cofferdam or bunding will be required. This could be in the form of dumpy bags or sheet steel piled walling system. The working area would require pumping to maintain some form of practical working environment.

The existing sewer pipe would need to be replaced (where damaged) and the outfall incorporated into the new concrete foundations. The concrete foundation would be constructed to approximately 1.2m above beach level to tie into the similar structure on the western end of the quay and the lower 500mm or so could extend back into the excavated quay by some 1.5 – 2m giving additional protection from erosion. This was suggested instead of a formal masonry faced mass concrete wall due to the increased bearing pressure the latter would impose. Precast concrete units could also be considered due to the reduce construction time.

As with Option 1, the wall would be rebuilt using as much existing stone as available and backfilled with a 6N1 material or possibly 505 drainage material.

Pro's: *Construction type matches west end of quay. Provides additional protection against erosion in critical area. Bearing pressure only marginally increased.*
Con's: *Flexible nature of existing construction lost. Protecting exposed works from tidal action during construction.*



OPTION 2 REBUILD EXISTING WALL ON CONCRETE FOUNDATIONS

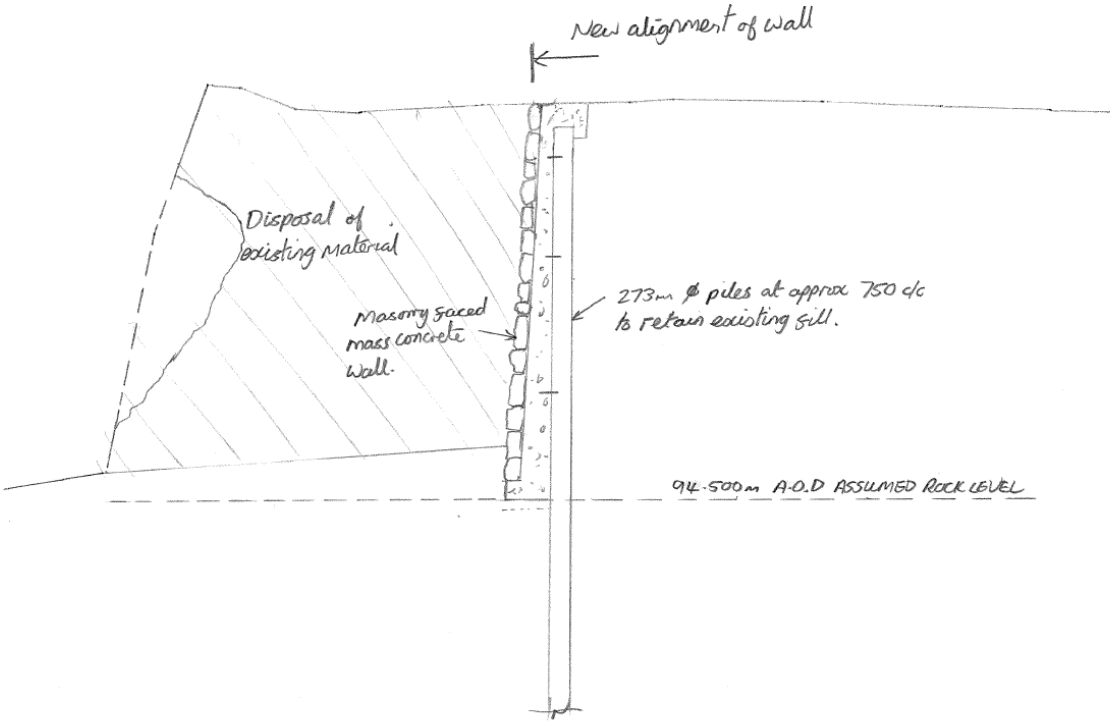
Option 3 – Masonry faced piled retaining wall on new alignment
This option would involve a dramatic change to the appearance of the existing quay as it involves realigning the wall some 3 – 4m behind the face of the quay to continue the alignment of eastern approach wall.

This would be constructed by the use of a number of mini-piles inserted in line to produce a retaining structure. This then provides a safe working area for operatives. The existing wall will be demolished with all foundations removed to at least 300mm below the river bed level which will be made good. A masonry wall will be constructed in front of the piled wall with concrete backing filling the void to the piles. Existing stone will be reused as much as possible.

This option could possibly do away with the requirement for a bund or cofferdam as the remaining quay is protected by the piles. However construction time would be quicker if this protection option was still utilised.

Despite changing the appearance of the quay by removing it's promontory, this option may reduce future erosion of the facing by eliminating the obstructive sections of quay with regard to tidal flow.

Pro's: *Safe method of construction. Provides improved protection against future erosion.*
Con's: *Uncertain public opinion to alignment change. Further investigation required to test rock suitable for piling into.*



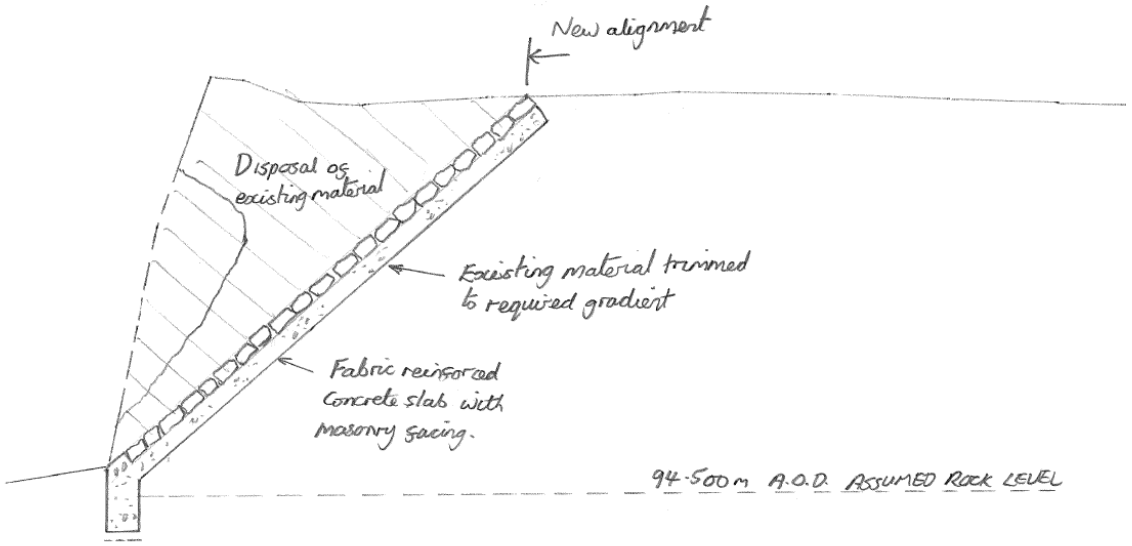
OPTION 3 MASONRY FACED PILED RETAINING WALL ON NEW ALIGNMENT

Option 4 – Change quay into a revetment
This option would also involve a dramatic change to the appearance of the existing quay. It would involve reshaping the wall into a revetment such that the top of the wall matches the alignment of eastern approach wall.

This option has not yet been considered in detail as to how it would be constructed but the idea is to construct a sloping masonry faced concrete wall from the existing toe back approximately 4m to the top of the eastern approach wall. This would produce a 45 degree slope to the wall, which I believe would limit future erosion. It would be less of a retaining structure due to it being closer to the natural repose of the retained fill, but more of a protection layer to the land behind.

It is most likely that bunding or a cofferdam would still be required to construct the works.

Pro's: *Prevents future collapse. Provides improved protection against future erosion.*
Con's: *Uncertain public opinion to alignment change.*

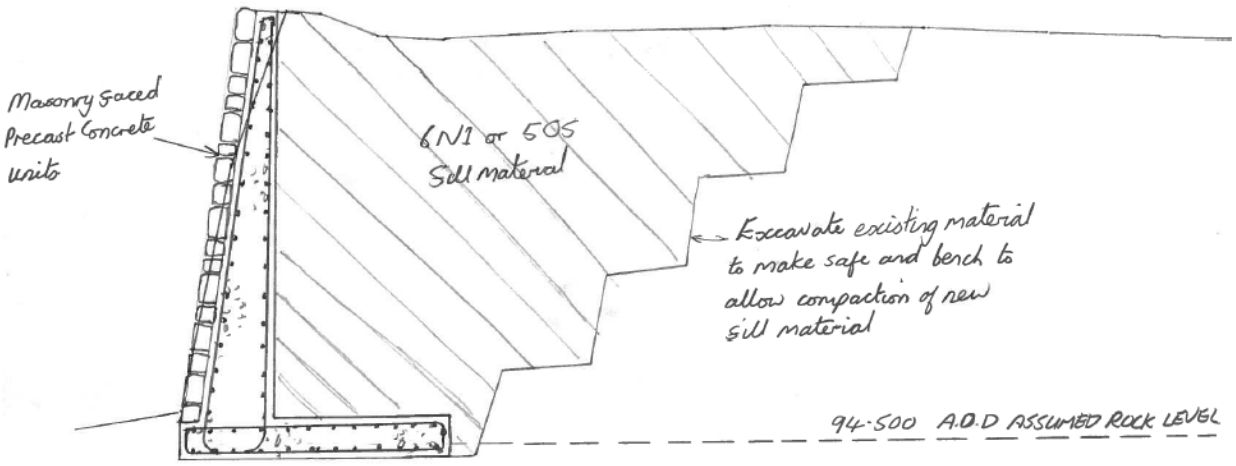


OPTION 4 CHANGE QUAY INTO REVETMENT

Option 5 – Precast Concrete Retaining Wall Units
This option would involve constructing precast concrete units off-site to be craned into place on suitable foundations. The joint between units would be required to be designed to prevent ingress of water. Precast units would potentially limit the time working at the base of the wall which is affected most by the tidal conditions. The units could also be mostly masonry faced prior to placing so that only the area around the joints would need facing in situ.

The bearing pressure on the base should not be too excessive due to the limited volume of concrete. However, the reinforcement would be liable to future corrosion due to the constant wet/dry cycle of salt water if the concrete cover is breached. The use of more expensive stainless steel reinforcement would perhaps be a sensible option in this situation.

Pro's: *Quick to install. Less time working in tidal waters.*
Con's: *Existing stone could not be used. Corner section difficult.*



OPTION 5 PRECAST CONCRETE RETAINING WALL UNITS